State of California
AIR RESOURCES BOARD

CALIFORNIA EVAPORATIVE EMISSION STANDARDS AND TEST PROCEDURES FOR 2001 AND SUBSEQUENT MODEL MOTOR VEHICLES

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NOTE: This document is incorporated by reference in section 1976(c), title 13, California Code of Regulations (CCR). Additional requirements necessary to complete an application for certification of motor vehicles are contained in other documents that are designed to be used in conjunction with this document. These other documents include:

1. “California 2001 through 2014 Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2009 through 2016 Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles” (incorporated by reference in section 1961(d), title 13, CCR);

2. “California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles” (incorporated by reference in section 1961.2 (d), title 13, CCR);

3. “California Exhaust Emission Standards and Test Procedures for 2005 – 2008 Zero-Emission Vehicles, and 2001 – 2008 Model Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck, and Medium-Duty Vehicle Classes” (incorporated by reference in section 1962(e), title 13, CCR);

4. “California Exhaust Emission Standards and Test Procedures for 2009 and Subsequent Model Zero-Emission Vehicles and Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck, and Medium-Duty Vehicle Classes” (incorporated by reference in section 1962.1(h), title 13, CCR);

5. “California Refueling Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles” (incorporated by reference in section 1978(b), title 13, CCR);

6. "California Exhaust Emission Standards and Test Procedures for 1987 through 2003 Model Heavy-Duty Otto-Cycle Engines and Vehicles," as incorporated by reference in section 1956.8(d), title 13, CCR;

7. "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines," as incorporated by reference in section 1956.8(d), title 13, CCR.

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CALIFORNIA EVAPORATIVE EMISSION STANDARDS AND TEST PROCEDURES FOR 2001 AND SUBSEQUENT MODEL MOTOR VEHICLES

The provisions of Title 40, Code of Federal Regulations (CFR), Part 86, Subparts A and B (as adopted or amended as of July 1, 1989); Subpart S (as adopted or amended on May 4, 1999); and, such sections of these Subparts as last amended on such other date set forth next to the 40 CFR Part 86 section title listed below, insofar as those subparts pertain to evaporative emission standards and test procedures, are hereby adopted as the "California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Years," with the following exceptions and additions:

PART I. GENERAL CERTIFICATION REQUIREMENTS FOR EVAPORATIVE EMISSIONS

A. 40 CFR §86.1801-01 Applicability.

1.1. These evaporative standards and test procedures are applicable to all new 2001 and subsequent model gasoline-, liquefied petroleum- and alcohol-fueled passenger cars, light-duty trucks, medium-duty vehicles, heavy-duty vehicles, hybrid electric vehicles (including fuel-flexible, dual fuel and bi-fuel vehicles, and 2012 and subsequent model-year off-vehicle charge capable hybrid electric vehicles), and motorcycles. These standards and test procedures do not apply to motor vehicles that are exempt from exhaust emission certification, dedicated petroleum-fueled diesel vehicles, dedicated compressed natural gas-fueled vehicles, or hybrid electric vehicles that have sealed fuel systems which can be demonstrated to have no evaporative emissions. A manufacturer may elect to certify 2009 through 2011 model-year off-vehicle charge capable hybrid electric vehicles using these provisions. In cases where a provision applies only to a certain vehicle group based on its model year, vehicle class, motor fuel, engine type, or other distinguishing characteristics, the limited applicability is cited in the appropriate section.

1.2. For general certification purposes, and except as otherwise noted in these test procedures, the requirements set forth in the "California 2001 through 2014 Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2009 through 2016 Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles," the "California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles," the "California Exhaust Emission Standards and Test Procedures for 2005 – 2008 Model Zero-Emission Vehicles, and 2001 – 2008 Model Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck, and Medium-Duty Vehicle Classes," the "California Exhaust Emission Standards and Test Procedures for 2009 and Subsequent Model

Zero-Emission Vehicles and Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck, and Medium-Duty Vehicle Classes," and the "California Refueling Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles," shall apply to light- and medium-duty vehicles; the "California Exhaust Emission Standards and Test Procedures for 1987 through 2003 Model Heavy-Duty Otto-Cycle Engines and Vehicles," and the "California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines," shall apply to heavy-duty vehicles; and, section 1958, title 13, CCR shall apply to motorcycles.

1.3. Approval of vehicles that are not exhaust emission tested using a chassis dynamometer pursuant to section 1961, title 13, CCR shall be based on an engineering evaluation of the system and data submitted by the applicant.

1.4. Reference to light-duty trucks in the federal CFR shall mean light-duty trucks and medium-duty vehicles. Regulations concerning methanol in the Title 40, CFR Part 86, shall mean methanol and ethanol, except as otherwise indicated in these test procedures.

1.5. The term "[no change]" means that these test procedures do not modify the applicable federal requirement.

1.6. In those instances where the testing conditions or parameters are not practical or feasible for vehicles operating on LPG fuel, the manufacturer shall provide a test plan that provides equal or greater confidence in comparison to these test procedures. The test plan must be approved in advance by the Executive Officer.

B. Definitions, Acronyms, Terminology

1. These test procedures incorporate by reference the definitions set forth in the "California 2001 through 2014 Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2009 through 2016 Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles," the "California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles," and the "California Exhaust Emission Standards and Test Procedures for 2009 and Subsequent Model Zero-Emission Vehicles and Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck, and Medium-Duty Vehicle Classes," including the incorporated definitions from the Code of Federal Regulations. In addition, the following definitions apply:

1.1. "Non-integrated refueling canister-only system" means a subclass of a non-integrated refueling emission control system, where other non-refueling related evaporative emissions from the vehicle are stored in the fuel tank, instead of in a vapor storage unit(s).

1.2. “Sealed fuel system” means a non-liquid phase fuel system, on-board a vehicle, that stores, delivers, and meters the fuel under a very high pressure, and which inherently has no evaporative-related emissions, due to design specifications that eliminate the escape of any fuel vapors, under normal vehicle operations.

1.3. “2-gram breakthrough” means the point at which the cumulative quantity of hydrocarbons emitted from a stabilized canister vapor storage unit, during the loading process of the unit, is equal to 2 grams.

C. Useful Life

1. §86.1805-01. Delete. For vehicles certified to the emission standards in section I.E.1.(a), "useful life" shall have the same meaning as provided in section 2112, title 13, CCR. For vehicles certified to the emission standards in sections I.E.1.(c), I.E.1.(d), and I.E.1.(e), the "useful life" shall be 15 years or 150,000 miles, whichever first occurs.

D. General Standards; increase in emissions; unsafe conditions; waivers

1. Light- and Medium-Duty Vehicles.

1.1. Amend §86.1810-01 (December 8, 2005) as follows:

(a) through (g). [The provisions of these paragraphs are contained in the “California 2001 through 2014 Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2009 through 2016 Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles,” and the “California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles.”]

(h) For alcohol vehicles, hydrocarbon evaporative emissions shall be expressed as OMHCE.

(i) [No change.]

(j) Evaporative Emissions general provisions.

(1) The evaporative standards in section E. of this part apply equally to certification and in-use vehicles and trucks.

(2) For certification testing only, a manufacturer may conduct testing to quantify a level of stabilized non-fuel evaporative emissions for an individual certification test vehicle. Testing may be conducted on a representative vehicle to determine the non-fuel evaporative emission characteristics of the certification test vehicle. The demonstration must be submitted for advance approval by the Executive Officer and include a description of the sources of vehicle non-fuel evaporative emissions, the methodology for the quantification of the non-fuel emissions, an estimated non-fuel emission decay rate, and the stabilized non-fuel emission level. The demonstrated stabilized level of non-fuel evaporative emissions may be used in place of the test vehicle non-fuel evaporative emissions and be combined with the vehicle fuel evaporative emissions to determine compliance with the evaporative emission standard.

(3) [No change.]

(4) [No change.]

(k) through (n) [The provisions of these paragraphs are contained in the "California Refueling Emission Standards and Test Procedures for 2001 and Subsequent Model Year Motor Vehicles."]

(o) through (p). [The provisions of these paragraphs are contained in the “California 2001 through 2014 Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2009 through 2016 Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles" and the “California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles.”]

2. Heavy-Duty Vehicles. Approval of heavy-duty vehicles over 14,000 lbs. GVWR and incomplete medium-duty vehicles shall be based on an engineering evaluation of the system and data submitted by the applicant. Such evaluation may include successful public usage on light-duty or medium-duty vehicles, adequate capacity of storage containers, routing of lines to prevent siphoning, and other emissions-related factors deemed appropriate by the Executive Officer. For LPG systems, this engineering evaluation shall include: emissions from pressure relief valves, carburetion systems and other sources of leakage; emissions due to fuel system wear and aging, and evaporative emission test data from light-duty or medium-duty vehicles with comparable systems.

E. Emission Standards

1. Evaporative Emission Standards for 2001 and Subsequent Model Year Vehicles Other Than Motorcycles.

(a) For the 2001 through 2005 model year vehicles identified below, tested in accordance with the test procedure sequence set forth in Part III, the maximum projected total hydrocarbon evaporative emissions are:

Class of Vehicle	Running Loss (grams per mile)	Three-Day Diurnal + Hot Soak (grams per test)	Two-Day Diurnal + Hot Soak (grams per test)
Passenger Cars, Light-Duty Trucks	0.05	2.0	2.5
Medium-Duty Vehicles (6,001 - 8,500 lbs. GVWR)			
with fuel tanks < 30 gallons	0.05	2.0	2.5
with fuel tanks ≥ 30 gallons	0.05	2.5	3.0
Medium-Duty Vehicles (8,501 - 14,000 lbs. GVWR)	0.05	3.0 (1)	3.5
	0.05	2.0 (2)	3.5
Heavy-Duty Vehicles (over 14,000 lbs. GVWR)	0.05	2.0	4.5
Hybrid Electric PCs, LDTs and MDVs	0.05	2.0	2.5

(1) The standards in this row apply to medium-duty vehicles certified according to the exhaust standards in section 1961, title 13, CCR.

(2) The standards in this row apply to incomplete medium-duty vehicles certifying to the exhaust standards in section 1956.8, title 13, CCR.

(b) Zero emission vehicles shall produce zero fuel evaporative emissions under any and all possible operational modes and conditions.

(c) For 2001 through 2014 model year vehicles, the optional zero-fuel evaporative emission standards for the three-day and two-day diurnal-plus-hot-soak tests are 0.35 grams per test for passenger cars, 0.50 grams per test for light-duty trucks 6,000 lbs. GVWR and under, and 0.75 grams per test for light-duty trucks from 6,001 to 8,500 lbs. GVWR, to account for vehicle non-fuel evaporative emissions (resulting from paints, upholstery, tires, and other vehicle sources). Vehicles demonstrating compliance with these evaporative emission standards shall also have zero (0.0) grams of fuel evaporative emissions per test for the three-day and two-day diurnal-plus-hot-soak tests. The "useful life" shall be 15 years or 150,000 miles, whichever occurs first. In lieu of demonstrating compliance with the zero (0.0) grams of fuel evaporative emissions per test over the three-day and two-day diurnal-plus-hot-soak tests, the manufacturer may submit for advance Executive Officer approval a test plan to demonstrate that the vehicle has zero (0.0) grams of fuel evaporative emissions throughout its useful life.

Additionally, in the case of a SULEV vehicle for which a manufacturer is seeking a partial ZEV credit, the manufacturer may prior to certification elect to have measured fuel evaporative emissions reduced by a specified value in all certification and in-use testing of the vehicle as long as measured mass exhaust emissions of NMOG for the vehicle are increased in all certification and in-use testing. The measured fuel evaporative emissions shall be reduced in increments of 0.1 gram per test, and the measured mass exhaust emissions of NMOG from the vehicle shall be increased by a gram per mile factor, to be determined by the Executive Officer, for every 0.1 gram per test by which the measured fuel evaporative emissions are reduced. For the purpose of this calculation, the evaporative emissions shall be measured, in grams per test, to a minimum of three significant figures.

(d) For the 2004 through 2014 model motor vehicles identified below, tested in accordance with the test procedure sequence set forth in Part III, the maximum projected total hydrocarbon evaporative emissions are:

Vehicle Type	Hydrocarbon Standards[(1)(2)]		
	Running Loss (grams per mile)	Three-Day Diurnal + Hot Soak (grams per test)	Two-Day Diurnal + Hot Soak (grams per test)
Passenger Cars	0.05	0.50	0.65
Light-Duty Trucks (under 8,501 lbs. GVWR)			
6,000 lbs. GVWR and under	0.05	0.65	0.85

6,001 - 8,500 lbs. GVWR	0.05	0.90	1.15
Medium-Duty Vehicles (8,501 - 14,000 lbs. GVWR)	0.05	1.00	1.25
Heavy-Duty Vehicles (over 14,000 lbs. GVWR)	0.05	1.00	1.25

(1) (a) These evaporative emission standards shall be phased-in beginning with the 2004 model year. Each manufacturer, except small volume manufacturers, shall certify at a minimum the specified percentage of its vehicle fleet to the evaporative emission standards in this table or the optional zero-evaporative emission standards in section I.E.1.(c) according to the schedule set forth below. For purposes of this paragraph (a), each manufacturer's vehicle fleet consists of the total projected California sales of the manufacturer's gasoline-fueled, liquefied petroleum-fueled and alcohol-fueled passenger cars, light-duty trucks, medium-duty vehicles, and heavy-duty vehicles.

Model Year	*Minimum Percentage of Vehicles Certified to the Standards in Sections I.E.1.(c) and I.E.1.(d)*
2004	40
2005	80
2006 and subsequent	100

A small volume manufacturer shall certify 100 percent of its 2006 and subsequent model vehicle fleet to the evaporative emission standards in the table or the optional zero-evaporative emission standards in section I.E.1.(c).

All 2004 through 2005 model-year motor vehicles which are not subject to these standards or the standards in section E.1.(c) pursuant to the phase-in schedule shall comply with the requirements of section I.E.1.(a).

(b) A manufacturer may use an "Alternative or Equivalent Phase-in Schedule" to comply with the phase-in requirements. An "Alternative Phase-in" is one that achieves at least equivalent emission reductions by the end of the last model year of the scheduled phase-in. Model-year emission reductions shall be calculated by multiplying the percent of vehicles (based on the manufacturer's projected California sales volume of the applicable vehicle fleet) meeting the new requirements per model year by the number of model years implemented prior to and including the last model year of the scheduled phase-in. The "cumulative total" is the summation of the model-year emission reductions (e.g., the three model-year 40/80/100 percent phase-in schedule would be calculated as: (40%*3 years) + (80%*2 years) + (100%*1 year) = 380). The required cumulative total for the phase-in of these standards is 380 emission reductions. Any alternative phase-in that results in an equal or larger cumulative total than the required cumulative total by the end of the last model year of the scheduled phase-in shall be considered acceptable by the Executive Officer only if all vehicles subject to the phase-in comply with the respective requirements in the last model year of the required phase-in schedule. A manufacturer shall be allowed to include vehicles introduced before the first model year of the scheduled phase-in (e.g., in the previous example, 10 percent introduced one year before the scheduled phase-in begins would be calculated as: (10%*4 years) = 40) and added to the cumulative total.

(c) These evaporative emission standards do not apply to zero-emission vehicles.

(2) In-use compliance whole vehicle testing shall not begin until the motor vehicle is at least one year from the production date and has accumulated a minimum of 10,000 miles. For vehicles introduced prior to the 2007 model year, in-use compliance standards of 1.75 times the "Three-Day Diurnal + Hot-Soak" and "Two-Day Diurnal + Hot-Soak" gram per test standards shall apply for only the first three model years of an evaporative family certified to a new standard.

(e) For 2015 and subsequent model motor vehicles, the following evaporative emission requirements apply:

(i) A manufacturer must certify all vehicles subject to this section to the emission standards specified in either Option 1 or Option 2 below.

(A) Option 1. The total hydrocarbon evaporative emissions from 2015 and subsequent model motor vehicles, tested in accordance with the test procedure sequence set forth in Part III, shall not exceed:

Vehicle Type	Hydrocarbon Emission Standards		
	Running Loss (grams per mile)	Three-Day Diurnal + Hot Soak and Two-Day Diurnal + Hot Soak	
		Whole Vehicle (grams per test)	Fuel Only[(1)] (grams per test)
Passenger Cars	0.05	0.350	0.0
Light-Duty Trucks 6,000 lbs. GVWR and under	0.05	0.500	0.0
Light-Duty Trucks 6,001 - 8,500 lbs. GVWR	0.05	0.750	0.0
Medium-Duty Passenger Vehicles	0.05	0.750	0.0
Medium-Duty Vehicles (8,501 - 14,000 lbs. GVWR)	0.05	0.750	0.0
Heavy-Duty Vehicles (over 14,000 lbs. GVWR)	0.05	0.750	0.0

(1) In lieu of demonstrating compliance with the fuel-only emission standard (0.0 grams per test) over the three-day and two-day diurnal plus hot soak tests, a manufacturer may, with advance Executive Officer approval, demonstrate compliance through an alternate test plan.

(B) Option 2. The total hydrocarbon evaporative emissions from 2015 and subsequent model motor vehicles, tested in accordance with the test procedure sequence set forth in Part III, shall not exceed:

Vehicle Type	Hydrocarbon Emission Standards		
	Running Loss (grams per mile)	Highest Whole Vehicle Diurnal + Hot Soak(1)(2)(3) (grams per test)	Canister Bleed(4) (grams per test)
Passenger Cars; and Light-Duty Trucks 6,000 lbs. GVWR and under, and 0 - 3,750 lbs. LVW	0.05	0.300	0.020
Light-Duty Trucks 6,000 lbs. GVWR and under, and 3,751 – 5,750 lbs. LVW	0.05	0.400	0.020
Light-Duty Trucks 6,001 - 8,500 lbs. GVWR; and Medium-Duty Passenger Vehicles	0.05	0.500	0.020
Medium-Duty Vehicles (8,501 - 14,000 lbs. GVWR); and Heavy-Duty Vehicles (over 14,000 lbs. GVWR)	0.05	0.600	0.030

(1) The manufacturer shall determine compliance by selecting the highest whole vehicle diurnal plus hot soak emission value of the Three-Day Diurnal Plus Hot Soak Test and of the Two-Day Diurnal Plus Hot Soak Test.

(2) Fleet-Average Option for the Highest Whole Vehicle Diurnal Plus Hot Soak Emission Standard Within Each Emission Standard Category. A manufacturer may optionally comply with the highest whole vehicle diurnal plus hot soak emission standards by using fleet-average hydrocarbon emission values. To participate, a manufacturer must utilize the fleet-average option for all of its emission standard categories and calculate a separate fleet-average hydrocarbon emission value for each emission standard category. The emission standard categories are as follows: (1) passenger cars and light-duty trucks 6,000 pounds GVWR and under, and 0 - 3,750 pounds LVW; (2) light-duty trucks 6,000 pounds GVWR and under, and 3,751 – 5,750 pounds LVW; (3) light-duty trucks 6,001 - 8,500 pounds GVWR and medium-duty passenger vehicles; and (4) medium-duty and heavy-duty vehicles. The fleet-average hydrocarbon emission value for each emission standard category shall be calculated as follows:

$$\sum_{i=1}^{n} \mathbf{[}(\text{number of vehicles in the evaporative family})_i \text{ X } (\text{family emission limit})_i \mathbf{]} \div \sum_{i=1}^{n} (\text{number of vehicles in the evaporative family})_i$$

where "n" = a manufacturer's total number of Option 2 certification evaporative families within an emission standard category for a given model year;

"number of vehicles in the evaporative family" = the number of vehicles produced and delivered for sale in California in the evaporative family;

"family emission limit" = the numerical value selected by the manufacturer for the evaporative family that serves as the emission standard for the evaporative family with respect to all testing, instead of the emission standard specified in this section I.E.1.(e)(i)(B). The family emission limit shall not exceed 0.500 grams per test for passenger cars; 0.650 grams per test for light duty trucks 6,000 pounds GVWR and under; 0.900 grams per test for light-duty trucks 6,001 - 8,500 pounds GVWR; and 1.000 grams for medium-duty passenger vehicles, medium-duty vehicles, and heavy-duty vehicles. In addition, the family emission limit shall be set in increments of 0.025 grams per test.

(3) Calculation of Hydrocarbon Credits or Debits for the Fleet-Average Option.

(A) Calculation of Hydrocarbon Credits or Debits. For each emission standard category in the model year, a manufacturer shall calculate the hydrocarbon credits or debits, as follows:

[(Applicable Hydrocarbon Emission Standard for the Emission Standard Category) – (Manufacturer's Fleet-Average Hydrocarbon Emission Value for the Emission Standard Category)] X (Total Number of Affected Vehicles)

where "Total Number of Affected Vehicles" = the total number of vehicles in the evaporative families participating in the fleet-average option, which are produced and delivered for sale in California, for the emission standard category of the given model year.

A negative number constitutes hydrocarbon debits, and a positive number constitutes hydrocarbon credits accrued by the manufacturer for the given model year. Hydrocarbon credits earned in a given model year shall retain full value through the fifth model year after they are earned. At the beginning of the sixth model year, the hydrocarbon credits will have no value.

(B) Procedure for Offsetting Hydrocarbon Debits. A manufacturer shall offset hydrocarbon debits with hydrocarbon credits for each emission standard category within three model years after the debits have been incurred. If total hydrocarbon debits are not equalized within three model years after they have been incurred, the manufacturer shall be subject to the Health and Safety Code section 43211 civil penalties applicable to a manufacturer which sells a new motor vehicle that does not meet the applicable emission standards adopted by the state board. The cause of action shall be deemed to accrue when the hydrocarbon debits are not equalized by the end of the specified time period. For the purposes of Health and Safety Code section 43211, the number of vehicles not meeting the state board's emission standards shall be determined by dividing the total amount of hydrocarbon debits for the model year in the emission standard category by the applicable hydrocarbon emission standard for the model year in which the debits were first incurred.

Additionally, to equalize the hydrocarbon debits that remain at the end of the three model year offset period: (1) hydrocarbon credits may be exchanged between passenger cars and light-duty trucks 6,000 pounds GVWR and under and 0-3,750 pounds LVW, and light-duty trucks 6,000 pounds GVWR and under and 3,751-5,750 pounds LVW and (2) hydrocarbon credits may be exchanged between light-duty trucks 6,001-8,500 pounds GVWR and medium-duty passenger vehicles, and medium-duty vehicles and heavy-duty vehicles.

(4) Vehicle Canister Bleed Emission. Compliance with the canister bleed emission standard shall be determined based on the Bleed Emission Test Procedure described in section III.D.12. of these procedures and demonstrated on a stabilized canister system. Vehicles with a non-integrated refueling canister-only system are exempt from the canister bleed emission standard.

(ii) Phase-In Schedule. For each model year, a manufacturer shall certify, at a minimum, the specified percentage of its vehicle fleet to the evaporative emission standards set forth in section I.E.1.(e)(i), according to the implementation schedule set forth below. For the purpose of this section I.E.1.(e)(ii), the manufacturer's vehicle fleet consists of the vehicles produced and delivered for sale by the manufacturer in California that are subject to the emission standards in section I.E.1.(e)(i). All 2015 through 2022 model motor vehicles that are not subject to these standards pursuant to the phase-in schedule shall comply with the requirements for 2004 through 2014 model motor vehicles, as described in section I.E.1.(d).

Model Years	*Minimum Percentage of Vehicle Fleet*[1][2]
2015, 2016, and 2017	Average of vehicles certified to section I.E.1.(c) in model years 2012, 2013, and 2014[3][4]
2018 and 2019	60
2020 and 2021	80
2022 and subsequent	100

(1) For the 2018 through 2022 model years only, a manufacturer may use an alternate phase-in schedule to comply with the phase-in requirements. An alternate phase-in schedule must achieve equivalent compliance volume by the end of the last model year of the scheduled phase-in (2022). The compliance volume is the number calculated by multiplying the percent of vehicles (based on the manufacturer's projected sales volume of all vehicles) meeting the new requirements in each model year by the number of years implemented prior to and including the last model year of the scheduled phase-in, then summing these yearly results to determine a cumulative total. The cumulative total of the five year (60/60/80/80/100) scheduled phase-in set forth above is calculated as follows: (60*5 years) + (60*4 years) + (80*3 years) + (80*2 years) + (100*1 year) = 1040. Accordingly, the required cumulative total for any alternate phase-in schedule of these emission standards is 1040. The Executive Officer shall consider acceptable any alternate phase-in schedule that results in an equal or larger cumulative total by the end of the last model year of the scheduled phase-in (2022).

(2) Small volume manufacturers are not required to comply with the phase-in schedule set forth in this table. Instead, they shall certify 100 percent of their 2022 and subsequent model year vehicle fleet to the evaporative emission standards set forth in section I.E.1.(e)(i)(A) or section I.E.1.(e)(i)(B).

(3) The percentage of vehicle fleet averaged across the 2015, 2016, and 2017 model years shall be used to determine compliance with this requirement.

(4) The minimum percentage required in the 2015, 2016, and 2017 model years is determined by averaging the percentage of vehicles certified to the emission standards in section I.E.1.(c) in each of the manufacturer's 2012, 2013, and 2014 model motor vehicle fleets. For the purpose of calculating this average, a manufacturer shall use the percentage of vehicles produced and delivered for sale in California for the 2012, 2013, and 2014 model years. A manufacturer may calculate this average percentage using the projected sales for these model years in lieu of actual sales.

(iii) Carry-Over of 2014 Model-Year Evaporative Families Certified to the Zero-Fuel Evaporative Emission Standards. A manufacturer may carry over 2014 model motor vehicles certified to the zero-fuel (0.0 grams per test) evaporative emission standards set forth in section I.E.1.(c) through the 2018 model year and be considered compliant with the requirements of section I.E.1.(e). If the manufacturer chooses to participate in the fleet-average option for the highest whole vehicle diurnal plus hot soak emission standard, the following family emission limits are assigned to these evaporative families for the calculation of the manufacturer's fleet-average hydrocarbon emission value.

Vehicle Type	Highest Whole Vehicle Diurnal + Hot Soak (grams per test)
Passenger Cars	0.300
Light-Duty Trucks 6,000 lbs. GVWR and under, and 0 - 3,750 lbs. LVW	0.300
Light-Duty Trucks 6,000 lbs. GVWR and under, and 3,751 – 5,750 lbs. LVW	0.400
Light-Duty Trucks 6,001 - 8,500 lbs. GVWR	0.500

(iv) Pooling Provision. The following pooling provision applies to the fleet-average option for the Highest Whole Vehicle Diurnal Plus Hot Soak Emission Standard in section I.E.1.(e)(i)(B). and to the phase-in requirements in section I.E.1.(e)(ii).

(A) For the fleet-average option set forth in section I.E.1.(e)(i)(B), a manufacturer must demonstrate compliance, for each model year, based on one of two options applicable throughout the model year, either:

Pooling Option 1: the total number of passenger cars, light-duty trucks, medium-duty passenger vehicles, medium-duty vehicles, and heavy-duty vehicles that are certified to the California evaporative emission standards in section I.E.1.(e)(i)(B), and are produced and delivered for sale in California; or

Pooling Option 2: the total number of passenger cars, light-duty trucks, medium-duty passenger vehicles, medium-duty vehicles, and heavy-duty vehicles that are certified to the California evaporative emission standards in section I.E.1.(e)(i)(B), and are produced and delivered for sale in California, the District of Columbia, and all states that have adopted California's evaporative emission standards set forth in section I.E.1.(e)(i) for that model year pursuant to section 177 of the federal Clean Air Act (42 U.S.C. § 7507).

(B) For the phase-in requirements in section I.E.1.(e)(ii), a manufacturer must demonstrate compliance, for each model year, based on one of two options applicable throughout the model year, either:

Pooling Option 1: the total number of passenger cars, light-duty trucks, medium-duty passenger vehicles, medium-duty vehicles, and heavy-duty vehicles that are certified to the California evaporative emission standards in section I.E.1.(e)(i), and are produced and delivered for sale in California; or

Pooling Option 2: the total number of passenger cars, light-duty trucks, medium-duty passenger vehicles, medium-duty vehicles, and heavy-duty vehicles that are certified to the California evaporative emission standards in section I.E.1.(e)(i), and are produced and delivered for sale in California, the District of Columbia, and all states that have adopted California's evaporative emission standards set forth in section I.E.1.(e)(i) for that model year pursuant to section 177 of the federal Clean Air Act (42 U.S.C. § 7507).

(C) A manufacturer that selects Pooling Option 2 must notify the Executive Officer of that selection in writing prior to the start of the applicable model year or must comply with Pooling Option 1. Once a manufacturer has selected Pooling Option 2, that selection applies unless the manufacturer selects Option 1 and notifies the Executive Officer of that selection in writing before the start of the applicable model year.

(D) When a manufacturer is demonstrating compliance using Pooling Option 2 for a given model year, the term "in California" as used in section I.E.1.(e) means California, the District of Columbia, and all states that have adopted California's evaporative emission standards for that model year pursuant to Section 177 of the federal Clean Air Act (42 U.S.C. § 7507).

(E) A manufacturer that selects Pooling Option 2 must provide to the Executive Officer separate values for the number of vehicles in each evaporative family produced and delivered for sale in the District of Columbia and for each individual state within the average.

(v) Optional Certification for 2014 Model Motor Vehicles. A manufacturer may optionally certify its 2014 model motor vehicles to the evaporative emission standards set forth in section I.E.1.(e)(i), using the test fuel specified in section III.F.2.

2. Evaporative Emission Standards for 2001 and Subsequent Model Year Motorcycles. The maximum projected evaporative emission standards for 2001 and subsequent model gasoline-fueled motorcycles are:

Motorcycle Class	Hydrocarbons (grams per test)
Class I and Class II (50-279 cc)	2.0
Class III (280 cc and greater)	2.0

PART II. DURABILITY DEMONSTRATION

A. Light- and Medium-Duty Vehicles

1. Evaporative/refueling emission family determination. §86.1821-01 [No change.]

2. Durability Demonstration Procedures for Evaporative Emissions

2.1. §86.1824-01 Amend as follows:

(a) and (b) Delete.
(c) [No change.]
(d) Delete.
(e) [No change.]

2.2. For all passenger cars, light-duty trucks and chassis-certified medium-duty vehicles subject to the standards specified in section I.E. of these test procedures, demonstration of system durability and determination of three-day diurnal plus hot soak, two-day diurnal plus hot soak, and running loss emission deterioration factors ("evaporative DFs") for each evaporative/refueling family shall be based on tests of representative vehicles and/or systems. For purposes of evaporative emission durability testing, a representative vehicle is one which, with the possible exception of the engine and drivetrain, was built at least three months prior to the commencement of evaporative emission testing, or is one which the manufacturer demonstrates has stabilized non-fuel-related evaporative emissions.

2.3. Prior to commencement of a durability program, the manufacturer shall propose a method for durability testing and for determination of evaporative DFs for each evaporative/refueling family. The 4,000 and full useful life mile test points (or their equivalent) used in determining a DF must be within the standards of section I.E. or data will not be acceptable for use in the calculation of a DF, except for the following provision. For evaporative families certified to the emission standards in section I.E.(e)(i)(B) that utilize the fleet-average option, the 4,000 and full useful life mile test points for the highest whole vehicle diurnal plus hot soak emissions may exceed the emission standards of section I.E.(e)(i)(B) but must be less than the maximum allowed family emission limits set forth in footnote (2) of the table in section I.E.(e)(i)(B). A manufacturer is not required to obtain a new approval to use a previously approved evaporative emission durability procedure. The Executive Officer shall review the method, and shall approve it if it meets the following requirements:

2.3.1. The method must cycle and test the complete evaporative emission control system for the equivalent of the applicable vehicle useful life (i.e., 100,000, 120,000, or 150,000 miles) of typical customer use.

2.3.2. The method must reflect the flow of liquid and gaseous fuel through the evaporative emission control system, and the exposure (both peak and cyclical) to heat, vibration, and ozone expected based on typical customer use through the applicable useful life.

2.3.3. The method must have the specifications for acceptable system performance, including maximum allowable leakage based on typical customer use through the applicable vehicle useful life.

2.4. (a) In addition to the requirements of section II.A.2.3. above, for evaporative/refueling families subject to testing for exhaust emission durability, at least one evaporative emission test shall be conducted at 5,000, 40,000, 70,000, and 100,000 mile test points for all passenger car, and light-duty truck durability vehicles and at 5,000, 40,000, 70,000, 90,000, and 120,000 mile test points for all medium-duty durability vehicles. For all vehicles subject to the useful life requirement of 150,000 miles or 15 years for exhaust emissions, at least one evaporative emission test shall also be conducted at the 150,000 mile test point if the durability vehicle will be tested for exhaust emissions at the 150,000 mileage point. With prior written approval from the Executive Officer, manufacturers may terminate evaporative emissions testing at the mileage corresponding to 75 percent of the vehicle's useful life if no significant vehicle maintenance or emissions change are observed. Testing may be performed at different intervals as determined by the manufacturer using good engineering judgment. Evaporative emission testing may be performed at corresponding exhaust emission mileage points as set forth in section F.4. (40 CFR §86.1823) of the "California 2001 through 2014 Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2009 through 2016 Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles." and the "California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles." The 4,000 and full useful life mile test points (or their equivalent) used in determining a DF must be within the standards of section I.E. or data will not be acceptable for use in the calculation of a DF, except for the following provision. For evaporative families certified to the emission standards in section I.E.(e)(i)(B) that utilize the fleet-average option, the 4,000 and full useful life mile test points for the highest whole vehicle diurnal plus hot soak emissions may exceed the emission standards in section I.E.(i)(B), but must be less than the maximum allowed family emission limits set forth in footnote (2) of the table in section I.E.(e)(i)(B).

(b) For evaporative families subject to the requirements of section II.A.2.4.(a), manufacturers may demonstrate compliance by conducting an exhaust and evaporative emission test sequence at the end of the useful life of the exhaust durability data vehicle if the procedure set forth in section II.A.2.3. includes on-road, useful life deterioration on the evaporative test vehicle. The evaporative test vehicle used to meet the criteria in section II.A.2.3. must be deteriorated based on typical customer use throughout the applicable useful life. The manufacturer may perform unscheduled maintenance on the evaporative test vehicle at the final test point only upon prior Executive Officer approval, which shall be granted if the Executive Officer determines that the exhaust emission control system will not be affected, and the manufacturer demonstrates that the effectiveness of the evaporative emission control system is not diminished. The unscheduled maintenance must be conducted in accordance with 40 CFR §86.1834-01 as amended by the "California 2001 through 2014 Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2009 through 2016 Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles," and the "California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles."

2.5. The evaporative DFs determined under section II.A.2.4., if any, shall be averaged with the evaporative DFs determined under section II.A.2.3. to determine a single evaporative DF for each evaporative/refueling family. Evaporative DFs shall be generated for the running loss test and for the hot soak and the diurnal test in the three-day diurnal sequence, and for the hot soak and the diurnal test in the two-day diurnal sequence. The manufacturer may carry-across the DF generated in the three-day diurnal sequence to the two-day diurnal sequence if the manufacturer can demonstrate that the DF generated in the three-day diurnal sequence is at least as great as the DF generated in the two-day diurnal sequence.

3. Assigned DFs

3.1. §86.1826-01. [No change.]

3.2. A small volume manufacturer, as defined in section 1900(b), title 13, CCR, may request to certify evaporative/refueling families using assigned DFs.

3.3. Assigned DFs shall be used only where specific evaporative durability data do not exist. Assigned DFs shall be used in lieu of data from durability vehicle(s) only when a manufacturer demonstrates that it has control over design specifications, can provide development data, has in-house testing capabilities including accelerated aging of components/systems, and has evaluation criteria to ensure emission control system

(ECS) durability for the vehicle's useful life. The applying manufacturer must demonstrate that evaporative emission control system(s) developed or adapted for the particular vehicle will be durable and comply with the applicable emission standards for the vehicle's useful life. In evaluating any information provided, all relevant test data and design factors shall be considered, including but not limited to: canister nominal working capacity and location, purge strategy, method of purge control, fuel tank capacity, variables affecting fuel temperature (use of fuel return, material, shape of fuel tank, distance of fuel tank from road surface and distance from exhaust pipe, total underbody airflow), fuel and vapor hose materials, use of sensors and auxiliary control devices, technical comparison to an evaporative emission control system and the durability of any evaporative emission control system components that may have been used in other vehicle applications. The assigned DFs shall be applied only to entire evaporative/refueling families.

3.3.1. If emission control parts from other certified vehicles are utilized, then parameter comparisons of the above data must also be provided including part numbers where applicable. Evaporative emission control durability may include special in-house specifications.

3.4. The criteria for evaluating assigned DFs for evaporative/refueling families are the same as those for exhaust families. However, in determining evaporative/refueling family DFs these test procedures require that an evaporative family DF be determined by averaging DFs obtained from durability vehicle testing and from bench testing. Therefore, if a manufacturer meets the criteria as specified above, the Executive Officer may grant assigned DFs for either (or both) the durability vehicle DF or the bench DF.

3.5. The use of assigned DFs for bench test requirements does not depend upon the small volume manufacturer maximum sales limit (as defined in section 1900(b), title 13, CCR) and is applicable only to evaporative emission control systems which are similar to those used by the manufacturer for 1998 or later model-year vehicles and where an evaporative DF was determined.

4. Emission Data Vehicle Selection

4.1. §86.1828-01 [No change.]

4.2. In selecting medium-duty test vehicles, the Executive Officer shall consider the availability of test data from comparably equipped light-duty vehicles and the size of medium-duty vehicles as it relates to the practicability of evaporative emission testing.

5. Durability and Emission Testing Requirements; waivers

5.1. §86.1829-01 (December 8, 2005). [No change, except as otherwise noted.]

5.2. References to the "EPA" shall mean the Executive Officer of the Air Resources Board.

5.3. The optional provision for a manufacturer to provide a statement of compliance in lieu of a demonstration of compliance with the supplemental two-day diurnal plus hot soak emission standard for certification purposes, as contained in §86.1829-01(b)(2)(iii), shall be applicable to gasoline- and ethanol-fueled passenger cars, light-duty trucks, and medium-duty vehicles, including hybrid electric, fuel-flexible, dual fuel, and bi-fuel vehicles. Heavy-duty vehicles over 14,000 lbs. GVWR and incomplete medium-duty vehicles shall comply with the requirements of section I.D.2.

5.4. For purposes of certification, a 2012 and subsequent off-vehicle charge capable hybrid electric vehicle shall demonstrate the capability to purge its evaporative canister(s) during the exhaust emission test of the supplemental two-day diurnal plus hot soak emission test sequence.

5.4.1. This capability shall be demonstrated through compliance with the supplemental two-day diurnal plus hot soak emission standard, using the test sequence as specified in section III.D.3.1.18., except that the battery state-of-charge setting prior to the standard three-phase exhaust test shall be at the lowest level allowed by the manufacturer in order to maximize the cumulative amount of the auxiliary power unit activation during the three-phase exhaust test. Performance of this demonstration shall be in addition to the demonstration of compliance with the supplemental two-day diurnal plus hot soak emission standard required under section I.E.1., using the test sequence specified in section III.D.3.1.18.

5.4.2. In lieu of conducting the demonstration described in section II.A.5.4.1., a manufacturer may optionally conduct an engineering evaluation that demonstrates the evaporative emission control system's capability to purge its evaporative canister(s) during the exhaust emission test of the supplemental two-day diurnal plus hot soak emission test sequence. Such an evaluation shall be submitted to the Executive Officer, if requested. The manufacturer shall provide a statement of compliance in the certification application to indicate that the evaporative emission control system will purge the system's evaporative canister(s) during the supplemental two-day diurnal plus hot-soak test sequence. The evaluation would include, but not be limited to, canister type, canister volume, canister working capacity, fuel tank volume, fuel tank geometry, fuel delivery system, description of the input parameters and software strategy used to control canister purge, and nominal purge flow volume (i.e., amount of bed volumes) achieved by a test vehicle after completing the exhaust test of a supplemental two-day diurnal plus hot soak emission test sequence.

5.4.2.1. In lieu of the optional engineering demonstration specified in section II.A.5.4.2., manufacturers of 2012 and subsequent model-year off-vehicle charge capable hybrid electric vehicles that are equipped with non-integrated refueling canister-only systems may attest that the system's canister(s) shall have attained a purged condition when the vehicle has consumed at least 85% of its nominal fuel tank capacity.

5.4.2.1.1. This provision shall apply to such non-integrated refueling canister-only systems that inherently allow only refueling vapors to be stored in the canister(s); and, in which the inherent battery-charge operational mode characteristics cause the canister(s) to experience only either no purge or partial purge during the supplemental two-day diurnal plus hot soak test sequence.

5.4.2.1.2. The manufacturer shall provide the following statement in the application for certification, "The canisters in all vehicles equipped with the [indicate a specific evaporative/refueling family] shall have attained a purged condition when the vehicles have consumed at least 85% of their nominal fuel tank capacity. Assurance with this performance is based on the particular design specifications of the evaporative/refueling family, other inherent battery-charge operational mode characteristics of the vehicle's related systems, and other knowledge possessed by the manufacturer. Providing this assurance relieves the manufacturer of conducting a separate engineering evaluation for demonstrating the evaporative/refueling family's capability of purging its canister(s) during a supplemental two-day diurnal plus hot soak emission test sequence in which the battery state-of-charge setting is at the lowest level allowed by the manufacturer."

5.4.2.2. The manufacturer shall provide the specific information that supports its assurance of the system's performance with these requirements when requested by the Executive Officer.

5.4.2.3. The Executive Officer may withdraw the allowance to use the provision specified in section II.A.5.4.2.1., when information, including but not limited to that obtained from in-use vehicle testing, indicates non-compliance by the applicable evaporative/refueling family with the requirement.

B. Motorcycles

1. Durability Requirements. Certification of a motorcycle evaporative emission control system requires that the manufacturer demonstrate the durability of each evaporative emission control system family.

1.1. The motorcycle manufacturer can satisfy the vehicle durability testing requirements by performing an evaporative emission test at each scheduled exhaust emission test (40 CFR §86.427-78) during the motorcycle exhaust emission certification test (40 CFR §86.425-78) for each evaporative emission family. The minimum mileage accumulated shall be the total distance (one-half the useful life distance), although the manufacturer may choose to extend the durability test to the useful life distance (40 CFR §86.436-78). The displacement classes and test distances are shown below:

Displacement Class	Engine Displacement Range (cc)	Total Test Distance (km)	Useful Life Distance (km)
I	50-169	6,000	12,000
II	170-279	9,000	18,000
III	280 and greater	15,000	30,000

(i) All durability vehicles shall be built at least one month before the evaporative emissions test, or the manufacturer must demonstrate that the non-fuel related evaporative emissions have stabilized.

(ii) Testing at more frequent intervals than the scheduled exhaust emissions tests may be performed only when authorized in writing by the Executive Officer.

(iii) The DF shall be determined by calculating a least-squares linear regression of the evaporative emissions data with respect to mileage. The DF is defined as the extrapolated (from the regression) value at the useful life distance minus the interpolated value at the total test distance, where these distances are taken from the table in section II.B.1.1., above.

(iv) The extrapolated useful life and total test distance emissions shall be less than the applicable evaporative emission standards of section I.E.2. or the data will not be acceptable for use in the calculation of a DF and demonstration of compliance.

(v) Motorcycle manufacturers may use the ARB Component Bench Test Procedures or propose in their application a method for durability bench testing and determination of a DF for each evaporative family. The Executive Officer shall review the method, and shall approve it if it is similar to the requirements specified below. Any reference to 4,000 miles and 50,000 miles shall mean total test distance and useful life distance, respectively, as defined in section II.B.1.1. for the appropriate engine displacement class.

The manufacturer shall propose in its preliminary application for certification a method for durability testing and for determination of a DF for each evaporative family. The 4,000 and 50,000 mile test points (or their equivalent) used in determining the DF must be within the standards of section II.B1.1. or data will not be acceptable for use in the calculation of a DF. The Executive Officer shall review the method, and shall approve it if it meets the following requirements:

(A) The method must cycle and test the complete evaporative emission control system for the equivalent of at least 50,000 miles of typical customer use.

(B) The method must reflect the flow of liquid and gaseous fuel through the evaporative emission control system, and the exposure (both peak and cyclical) to heat, vibration, and ozone expected through 50,000 miles of typical customer use.

(C) The method must have the specifications for acceptable system performance, including maximum allowable leakage after 50,000 miles of typical customer use.

(vi) The DF determined under section II.B.1.1.(iii) shall be averaged with the DF determined under section II.B.1.1.(v) to determine a single evaporative emission DF for each evaporative family. For those motorcycles that do not require exhaust emission control system durability testing, the evaporative emission control system DF shall be determined under section II.B.1.1.(v) only. Compliance with the standard shall be demonstrated by performing an evaporative emission test on a stabilized motorcycle. The motorcycle shall have accumulated at least the minimum test distance. The extrapolated useful life distance emissions after applying the bench test-derived DF shall be less than the applicable evaporative emission standards of section I.E.2.

(vii) (A) Manufacturers of Class III motorcycles may elect to use an assigned evaporative emission control system DF, provided they meet the following requirements:

- Annual California motorcycle sales do not exceed 500 units, and

- The evaporative emission control system has been previously certified to meet the emission standards specified in these procedures, or the manufacturer provides test data from previous certification demonstrating that the system complies with the durability requirements set forth in this section.

(B) Manufacturers of Class III motorcycles using an assigned evaporative emission control system DF pursuant to section II.B.1.1.(vii)(A) may submit a written request for a waiver of evaporative emission testing. The waiver shall be granted if the Executive Officer determines that the motorcycles will comply with the evaporative emission standard. The determination shall be based on the performance of the evaporative emission control system on other motorcycles, the capacity of vapor storage containers, the routing of lines to prevent siphoning, and other emission-related factors determined by the Executive Officer to be relevant to evaluation of the waiver request.

(C) Nothing in this section shall be construed as an exemption from the exhaust emission standards and test procedures applicable pursuant to section 1958, title 13, CCR or section IV.4.(ii) of these test procedures.

(viii) The emission label (40 CFR §86.413-78) shall identify the evaporative emission family.

1.2. Motorcycle manufacturers with annual sales of less than 2,000 units for the three displacement classes in California are not required to submit the information specified by these test procedures to the Executive Officer. However, all information required by these test procedures must be retained on file and be made available on request to the Executive Officer for inspection. These manufacturers shall submit the following information for evaporative emission certification:

(i) A brief description of the vehicles to be covered by the Executive Order. (The manufacturer's sales data book or advertising, including specifications, will satisfy this requirement for most manufacturers.)

(ii) A statement signed by an authorized representative of the manufacturer stating "The vehicles described herein have been tested in accordance with the provisions of the "California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles," and on the basis of those tests, are in conformance with the aforementioned standards and test procedures."

1.3. The definitions for motorcycle evaporative emission families as set forth in EPA's MSAPC Advisory Circular No. 59, section D shall apply.

PART III. EVAPORATIVE EMISSION TEST PROCEDURES FOR LIGHT- AND MEDIUM-DUTY VEHICLES

A. Instrumentation

The instrumentation necessary to perform evaporative emission testing is described in 40 CFR 86.107-90. The following language is applicable in lieu of 40 CFR §86.107-90(a)(1):

1. **Diurnal Evaporative Emission Measurement Enclosure**

1.1. The diurnal evaporative emissions measurement enclosure shall be equipped with an internal blower or blowers coupled with an air temperature management system (typically air to water heat exchangers and associated programmable temperature controls) to provide for air mixing and temperature control. The blower(s) shall provide a nominal total flow rate of 0.8 ± 0.2 ft^3/min per ft^3 of the nominal enclosure volume, V_n. The inlets and outlets of the air circulation blower(s) shall be configured to provide a well dispersed air circulation pattern that produces effective internal mixing and avoids significant temperature or hydrocarbon and alcohol stratification. The discharge and intake air diffusers in the enclosure shall be configured and adjusted to eliminate localized high air velocities which could produce non-representative heat transfer rates between the vehicle fuel tank(s) and the air in the enclosure. The air circulation blower(s), plus any additional blowers if needed, shall also maintain a minimum wind speed of 5 mph under the fuel tank of the test vehicle. The Executive Officer may adjust wind speed and location to ensure sufficient air circulation around the fuel tank. The wind speed requirement may be satisfied by consistently using a blower configuration that has been demonstrated to meet a broad 5-mph air flow in the vicinity of the vehicle's fuel tank, subject to verification by the Executive Officer.

1.1.1. The enclosure temperature shall be taken with thermocouples located 3 feet above the floor of the approximate mid-length of each side wall of the enclosure and within 3 to 12 inches of each side wall and with a thermocouple located underneath the vehicle where it would provide a temperature measurement representative of the temperature of the air under the fuel tank. The temperature conditioning system shall be capable of controlling the internal enclosure air temperature to follow the prescribed temperature versus time cycle as specified in 40 CFR §86.133-90 as modified by section III.D.10. (diurnal breathing loss test) of these procedures within an instantaneous tolerance of $\pm 3.0^oF$ and an average tolerance of $\pm 2.0^oF$ as measured by the vehicle underbody thermocouple, and within an instantaneous tolerance of $\pm 5.0^oF$ as measured by the side wall thermocouples. The control system shall be tuned to provide a smooth temperature pattern which has a minimum of overshoot, hunting, and instability about the desired long term temperature profile.

1.2. The enclosure shall be of sufficient size to contain the test vehicle with personnel access space. It shall use materials on its interior surfaces which do not adsorb or desorb hydrocarbons, or alcohols (if the enclosure is used for alcohol-fueled vehicles). The enclosure shall be insulated to enable the test temperature profile to be achieved with a heating/cooling system which has minimum surface temperatures in the enclosure no less than $25.0^{o}F$ below the minimum diurnal temperature specification. The enclosure shall be equipped with a pressure transducer with an accuracy and precision of $\pm$ 0.1 inches H_2O. The enclosure shall be constructed with a minimum number of seams and joints which provide potential leakage paths. Particular attention shall be given to sealing and gasketing of such seams and joints to prevent leakage.

1.3. The enclosure shall be equipped with features which provide for the effective enclosure volume to expand and contract in response to both the temperature changes of the air mass in the enclosure, and any fluctuations in the ambient barometric pressure during the duration of the test. Either a variable volume enclosure or a fixed volume enclosure may be used for diurnal emission testing.

1.3.1. The variable volume enclosure shall have the capability of latching or otherwise constraining the enclosed volume to a known, fixed value, V_n. The V_n shall be determined by measuring all pertinent dimensions of the enclosure in its latched configuration, including internal fixtures, based on a temperature of $84^{o}F$, to an accuracy of $\pm$ 1/8 inch (0.5 cm) and calculating the net V_n to the nearest 1 ft^3. In addition, V_n shall be measured based on a temperature of $65^{o}F$ and $105^{o}F$. The latching system shall provide a fixed volume with an accuracy and repeatability of $0.005xV_n$. Two potential means of providing the volume accommodation capabilities are a moveable ceiling which is joined to the enclosure walls with a flexure; or a flexible bag or bags of Tedlar or other suitable materials which are installed in the enclosure and provided with flowpaths which communicate with the ambient air outside the enclosure. By moving air into and out of the bag(s), the contained volume can be adjusted dynamically. The total enclosure volume accommodation shall be sufficient to balance the volume changes produced by the difference between the extreme enclosure temperatures and the ambient laboratory temperature with the addition of a superimposed barometric pressure change of 0.8 in. Hg. A minimum total volume accommodation range of $\pm 0.07xV_n$ shall be used. The action of the enclosure volume accommodation system shall limit the differential between the enclosure internal pressure and the external ambient barometric pressure to a maximum value of $\pm$ 2.0 inches H_2O.

1.3.2. The fixed volume enclosure shall be constructed with rigid panels that maintain a fixed enclosure volume, which shall be referred to as V_n. V_n shall be determined by measuring all pertinent dimensions of the enclosure including internal fixtures to an accuracy of $\pm$ 1/8 inch (0.5 cm) and calculating the net V_n to the nearest 1 ft^3. The enclosure shall be equipped with an outlet flow stream that withdraws air at a low, constant rate and provides makeup air as needed, or by reversing the flow of air into and out of the enclosure in response to rising or falling temperatures. If inlet air is added continuously throughout the test, it must be filtered with activated carbon to provide a relatively constant hydrocarbon and alcohol level. Any method of volume accommodation shall maintain the differential between the enclosure internal pressure and the barometric pressure to a maximum value of ±2.0 inches of water. The equipment shall be capable of measuring the mass of hydrocarbon, and alcohol (if the enclosure is used for alcohol-fueled vehicles) in the inlet and outlet flow streams with a resolution of 0.01 gram. A bag sampling system may be used to collect a proportional sample of the air withdrawn from and admitted to the enclosure. Alternatively, the inlet and outlet flow streams may be continuously analyzed using an on-line Flame Ionization Detector (FID) analyzer and integrated with the flow measurements to provide a continuous record of the mass hydrocarbon and alcohol removal.

1.4. An online computer system or stripchart recorder shall be used to record the following parameters during the diurnal evaporative emissions test sequence:

- Enclosure internal air temperature
- Diurnal ambient air temperature specified profile as defined in 40 CFR §86.133-90 as modified in section III.D.10. (diurnal breathing loss test).
- Vehicle fuel tank liquid temperature
- Enclosure internal pressure
- Enclosure temperature control system surface temperature(s)
- FID output voltage recording the following parameters for each sample analysis:
  - zero gas and span gas adjustments
  - zero gas reading
  - enclosure sample reading
  - zero gas and span gas readings

1.4.1. The data recording system shall have a time resolution of 30 seconds and shall provide a permanent record in either magnetic, electronic or paper media of the above parameters for the duration of the test.

1.5. Other equipment configurations may be used if approved in advance by the Executive Officer. The Executive Officer shall approve alternative equipment configurations if the manufacturer demonstrates that the equipment will yield test results equivalent to those resulting from use of the specified equipment.

2. Running Loss Measurement Facility

2.1. For all types of running loss measurement test facilities, the following shall apply:

2.1.1. The measurement of vehicle running loss fuel vapor emissions shall be conducted in a test facility which is maintained at a nominal ambient temperature of 105.0^{o}F. Manufacturers have the option to perform running loss testing in either an enclosure incorporating atmospheric sampling equipment, or in a cell utilizing point source sampling equipment. Confirmatory testing or in-use compliance testing may be conducted by the Executive Officer using either sampling procedure. The test facility shall have space for personnel access to all sides of the vehicle and shall be equipped with the following test equipment:

-A chassis dynamometer which meets the requirements of 40 CFR §86.108-00 with the following addition to §86.108-00(d):

> Another dynamometer configuration may be used for running loss testing if approved in advance by the Executive Officer based on a demonstration that measured running loss emissions are equivalent to the emissions using the single-roll electric dynamometer described in 86.108-00(b)(2).

-A fuel tank temperature management system which meets the requirements specified in section III.A.2.1.3.

-A running loss fuel vapor hydrocarbon analyzer which meets the requirements specified in 40 CFR §86.107-90(a)(2)(i) and a running loss fuel vapor alcohol analyzer which meets the requirements specified in 40 CFR §86.107-90(a)(2)(ii).

-A running loss test data recording system which meets the requirements specified in section III.A.2.1.4.

2.1.2. All types of running loss test facilities shall be configured to provide an internal ambient temperature of 105^{o}F ± 5^{o}F maximum and ± 2^{o}F on average throughout the running loss test sequence. This shall be accomplished by any one or combination of the following techniques:

-Using the test facility without artificial cooling and relying on the residual heat in the test vehicle for temperature achievement.

-Adding insulation to the test facility walls.

-Using the test facility artificial cooling system (if so equipped) with the setpoint of the cooling system adjusted to a value not lower than 105.0^{o}F, where the cooling system set point refers to the internal test facility air temperature.

-Using a full range test facility temperature management system with heating and cooling capabilities.

2.1.3. Cell/enclosure temperature management shall be measured at the inlet of the vehicle cooling fan. The vehicle cooling fan shall be a road speed modulated fan which is controlled to a discharge velocity which matches the dynamometer roll speed at least up to 30 mph throughout the driving cycle. The fan outlet may discharge airflow to both the vehicle radiator air inlet(s) and the vehicle underbody. An additional fan, not to exceed 8,000 cfm, may be used to discharge airflow from the front of the vehicle directly to the vehicle underbody to control fuel temperatures.

2.1.3.1. The fuel tank temperature management system shall be configured and operated to control the fuel tank temperature profile of the test vehicle during the running loss test sequence. The use of a discrete fuel tank temperature management system is not required provided that the existing temperature and airflow conditions in the test facility are sufficient to match the on-road fuel tank liquid (T_{liq}) temperature profile of the test vehicle within a tolerance of $\pm 3.0^oF$ throughout the running loss driving cycle, and, if applicable, the fuel tank vapor (T_{vap}) temperature profile of the test vehicle within a tolerance of $\pm 5^oF$ throughout the running loss driving cycle and $\pm 3.0^oF$ during the final 120 second idle period of the test. The system shall provide a ducted air flow directed at the vehicle fuel tank which can be adjusted in flow rate and/or temperature of the discharge air to manage the fuel tank temperature. The system shall monitor the vehicle fuel tank temperature sensors located in the tank according to the specifications in section III.C.1. (40 CFR §86.129-80) during the running loss drive cycle. The measured temperature shall be compared to a reference on-road profile for the same platform/powertrain/fuel tank combination developed according to the procedures in section III.C.1. (40 CFR §86.129-80). The system shall adjust the discharge flow and/or temperature of the outlet duct to maintain the tank liquid temperature profile within $\pm 3.0^oF$ of the reference on-road liquid temperature profile throughout the test. If applicable, the vapor temperature shall match the reference on-road vapor temperature profile within $\pm 5.0^oF$ throughout the test and $\pm 3.0^oF$ during the final 120 second idle period. The system shall be designed to avoid heating or cooling of the fuel tank vapor space in a way that would cause vapor temperature behavior to be unrepresentative of the vehicle's on-road vapor profile. The system shall provide a discharge airflow up to 4,000 cfm. With advance Executive Officer approval, the system may provide a discharge airflow with a maximum of 6,000 cfm.

2.1.3.2. Blowers or fans shall be used to mix the enclosure contents during evaporative emission testing. The blowers or fans shall have a total capacity of at least 1.0 ft^3/min per ft^3 of V_n. The inlets and outlets of the air circulation blower(s) shall be configured to provide a well dispersed air circulation pattern that produces effective internal mixing and avoids significant temperature or hydrocarbon and alcohol stratification.

2.1.3.3. The temperature of the air supplied to the outlet duct shall be within a range of 90^oF to 160^oF for systems which utilize artificial heating and/or cooling of the air supply to the outlet duct. This requirement does not apply to systems which recirculate air from inside the test cell without temperature conditioning the airflow. The control system shall be tuned and operated to provide a smooth and continuous fuel tank temperature profile which is representative of the on-road temperature profile.

2.1.3.4. Direct fuel heating may be used to control fuel temperatures for vehicles under exceptional circumstances in which airflow alone is insufficient to control fuel temperatures. The heating system must not cause hot spots on the tank wetted surface that could cause local overheating of the fuel. Heat must not be applied to the vapor in the tank above the liquid fuel, nor near the liquid-vapor interface.

2.1.4. An on-line computer system or strip-chart recorder shall be used to record the following parameters during the running loss test sequence:

-Cell/enclosure ambient temperature
-Vehicle fuel tank liquid (T_{liq}) and, if applicable, vapor space (T_{vap}) temperatures
-Vehicle coolant temperature
-Vehicle fuel tank headspace pressure
-Reference on-road fuel tank temperature profile developed according to section III.C.1. (40 CFR §86.129-80)
-Dynamometer rear roll speed (if applicable)
-FID output voltage recording the following parameters for each sample analysis:
  -zero gas and span gas adjustments
  -zero gas reading
  -dilute sample bag reading (if applicable)
  -dilution air sample bag reading (if applicable)
  -zero gas and span gas readings

-methanol sampling equipment data:
  -the volumes of deionized water introduced into each impinger
  -the rate and time of sample collection
  -the volumes of each sample introduced into the gas chromatograph
  -the flow rate of carrier gas through the column
  -the column temperature
  -the chromatogram of the analyzed sample

2.2. If an enclosure, or atmospheric sampling, running loss facility is used, the following requirements (in addition to those in section III.A.2.1. above) shall also be applicable:

2.2.1. The enclosure shall be readily sealable and rectangular in shape. When sealed, the enclosure shall be gas tight in accordance with 40 CFR 86.117-90. Interior surfaces shall be impermeable and non-reactive to hydrocarbons, and to alcohol (if the enclosure is used for alcohol-fueled vehicles). One surface should be of flexible, impermeable, and non-reactive material to allow for minor volume changes, resulting from temperature changes.

2.2.2. In the event an artificial cooling or heating system is used, the surface temperature of the heat exchanging elements shall be a minimum of 70.0^{o}F.

2.2.3. The enclosure shall be equipped to supply air to the vehicle, at a temperature of 105 ± 5^{o}F, from sources outside of the running loss enclosure directly into the operating engine's air intake system. Supplemental air requirements shall be supplied by drawing air from the engine intake source.

2.3. If a point source running loss measurement facility (cell) is used, the following requirements (in addition to those in section III.A.2.1. above) shall also be applicable:

2.3.1. The running loss vapor collection system shall be configured to collect all running loss emissions from each of the discrete emissions sources, which include vehicle fuel system vapor vents, and transport the collected vapor emissions to a CFV or PDP based dilution and measurement system. The collection system shall consist of a collector at each discrete vehicle emissions source, lengths of heated sample line connecting each collector to the inlet of the heated sample pump, and lengths of heated sample line connecting the outlet of the heated sample pump to the inlet of the running loss fuel vapor sampling system. Up to 3 feet of unheated line connecting each of the vapor collectors to the heated sample lines shall be allowed. Each heated sample pump and its associated sample lines shall be maintained at a temperature between 175.0^{o}F and 200.0^{o}F to prevent condensation of fuel vapor in the sample lines. The heated sample pump(s) and its associated flow controls shall be configured and operated to draw a flow of ambient air into each collector at a flow rate of at least 40 standard cubic feet per hour (SCFH). The flow controls on each heated sampling system shall include an indicating flow meter which provides an alarm output to the data recording system if the flow rate drops below 40 SCFH by more than 5 percent. The collector inlet for each discrete emissions source shall be placed in proximity to the source as necessary to capture any fuel vapor emissions without significantly affecting flow or pressure of the normal action of the source. The collector inlets shall be designed to interface with the configuration and orientation of each specific source. For vapor vents which terminate in a tube or hose barb, a short length of tubing of an inside diameter larger throughout its length than the inside diameter of the vent outlet, may be used to extend the vent into the mouth of the collector as illustrated in Figure 1. For those vapor vent designs which are not compatible with such collector configurations and other emissions sources, the vehicle manufacturer shall supply a collector which is configured to interface with the vapor vent design or the specific emissions source design, and which terminates in a fitting approved by the Executive Officer. The Executive Officer shall approve the fitting if the manufacturer demonstrates that it is capable of capturing all vapors emitted from the source.

2.3.2. The running loss fuel vapor sampling system shall be a CFV or PDP based dilution and measurement system which further dilutes the running loss fuel vapors collected by the vapor collection system(s) with ambient air, collects continuously proportional samples of the diluted running loss vapors and dilution air in sample bags, and measures the total dilute flow through the sampling system over each test interval. In practice, the system shall be configured and operated in a manner which is directly analogous to an exhaust emissions constant volume sampling system, except that the input flow to the system is the flow from the running loss vapor collection system(s) instead of vehicle exhaust flow. The system shall be configured and operated to meet the following requirements:

2.3.2.1. The running loss fuel vapor sampling system shall be designed to measure the true mass of fuel vapor emissions collected by the running loss vapor collection system from the specified discrete emissions source. The total volume of the mixture of running loss emissions and dilution air shall be measured, and a continuously proportionated sample of volume shall be collected for analysis. Mass emissions shall be determined from the sample concentration and total flow over the test period.

2.3.2.2. The PDP-CVS shall consist of a dilution air filter and mixing assembly, heat exchanger, positive displacement pump, sampling system, and associated valves, pressure and temperature sensors. The PDP-CVS shall conform to the following requirements:

-The gas mixture temperature, measured at a point immediately ahead of the positive displacement pump, shall be within ± 10^{o}F of the designed operating temperature at the start of the test. The gas mixture temperature variation from its value at the start of the test shall be limited to ± 10^{o}F during the entire test. The temperature measuring system shall have an accuracy and precision of ± 2^{o}F.

-The pressure gauges shall have an accuracy and precision of ± 1.6 inches of water (± 0.4 kPa).

-The flow capacity of the CVS shall not exceed 350 CFM (0.165 m^3/s).

- Sample collection bags for dilution air and running loss fuel vapor samples shall be sufficient size so as not to impede sample flow.

2.3.2.3. The CFV sample system shall consist of a dilution air filter and mixing assembly, a sampling venturi, a critical flow venturi, a sampling system and assorted valves, and pressure and temperature sensors. The CFV sample system shall conform to the following requirements:

-The temperature measuring system shall have an accuracy and precision of ± 2°F and a response time of 0.100 seconds of 62.5 percent of a temperature change (as measured in hot silicone oil).
-The pressure measuring system shall have an accuracy and precision of ± 1.6 inches of water (0.4 kPa).
-The flow capacity of the CVS shall not exceed 350 CFM (0.165 m^3/s).
-Sample collection bags for dilution air and running loss fuel vapor samples shall be of sufficient size so as not to impede sample flow.

2.3.3. The on-line computer system or strip-chart recorder specified in section III.A.2.1.4. shall be used to record the following additional parameters during the running loss test sequence, if applicable:

-CFV (if used) inlet temperature and pressure
-PDP (if used) inlet temperature and pressure and differential pressure
-Running loss vapor collection system low flow alarm events

2.4. Other equipment configurations may be used if approved in advance by the Executive Officer. The Executive Officer shall approve alternate equipment configurations if the manufacturer demonstrates that the equipment will yield test results equivalent to those resulting from use of the specified equipment.

3. Hot Soak Evaporative Emission Measurement Enclosure

3.1. The enclosure shall be readily sealable, rectangular in shape, with space for personnel access to all sides of the vehicle. When sealed, the enclosure shall be gas tight in accordance with §86.117-90. Interior surfaces shall be impermeable and non-reactive to hydrocarbon, and to alcohol (if the enclosure is used for alcohol-fueled vehicles). One surface shall be of flexible, impermeable and non-reactive material to allow for minor volume changes, resulting from temperature changes. The enclosure shall be configured to provide an internal enclosure ambient temperature of 105°F ± 5°F maximum and ±2°F on average during the test time interval from 5 minutes after the enclosure is closed and sealed until the end of the one hour hot soak interval. For the first 5 minutes, the ambient temperature shall be maintained at 105°F ± 10°F. The enclosure shall be equipped with an internal air circulation blower(s). The blower(s) shall be sized to provide a nominal total flow rate within a range of 0.8 ± 0.2 ft^3/min per ft^3 of V_n. The inlets and outlets of the blower(s) shall be configured to provide a well dispersed air circulation pattern that produces effective internal mixing and avoids significant temperature or hydrocarbon and alcohol stratification. The discharge and intake air diffusers in the enclosure shall be configured and adjusted to eliminate localized high air velocities which could produce non-representative heat transfer rates between the vehicle fuel tank(s) and the air in the enclosure. The enclosure temperature shall be taken with thermocouples located 3 feet above the floor of the approximate mid-length of each side wall of the enclosure and within 3 to 12 inches of each side wall. This shall be accomplished by any one or combination of the following techniques:

-Using the enclosure without artificial cooling and relying on the residual heat in the test vehicle for temperature achievement.

-Adding insulation to the enclosure walls.

-Using the enclosure artificial cooling system (if so equipped) with the set point of the cooling system adjusted to a value not lower than 105.0^{o}F, where the cooling system set point refers to the internal enclosure air temperature.

-Using a full range enclosure temperature management system with heating and cooling capabilities.

3.2. In the event an artificial cooling or heating system is used, the surface temperature of the heat exchanging elements shall be a minimum of 70.0^{o}F.

3.3. The requirements in 40 CFR §86.107-90(a)(4) shall not apply.

B. Calibrations

1. Evaporative emission enclosure calibrations are specified in 40 CFR §86.117-90. Methanol measurements may be omitted when methanol-fueled vehicles will not be tested in the evaporative enclosure. Amend 40 CFR §86.117-90 to include an additional section III.B.1.1., to read:

1.1. Diurnal evaporative emission enclosure. The diurnal evaporative emission measurement enclosure calibration consists of the following parts: initial and periodic determination of enclosure background emissions, initial determination of enclosure volume, and periodic hydrocarbon (HC) and methanol retention check and calibration. Calibration for HC and methanol may be conducted in the same test run or in sequential test runs.

1.1.1. The initial and periodic determination of enclosure background emissions shall be conducted according to the procedures specified in §86.117-90(a)(1) through (a)(6). The enclosure shall be maintained at a nominal temperature of 105.0^{o}F throughout the four hour period. Variable volume enclosures may be operated in either the latched volume configuration, or with the variable volume feature active. Fixed volume enclosures shall be operated with inlet and outlet flow streams closed. The allowable enclosure background emissions of HC and/or methanol as calculated according to 40 CFR §86.117-90(a)(7) shall not be greater than 0.05 grams in 4 hours. The enclosure may be sealed and the mixing fan operated for a period of up to 12 hours before the initial HC concentration reading (C_{HCi}) and the initial methanol concentration reading (C_{CH3OHi}) is taken and the four hour background measurement period begins.

1.1.2. The initial determination of enclosure internal volume shall be performed according to the procedures specified in section III.A.1.3. If the enclosure will be used for hot soak determination, the determination of enclosure internal volume shall also be performed based on 105^{o}F.

1.1.3. The HC and methanol measurement and retention checks shall evaluate the accuracy of enclosure HC and methanol mass measurements and the ability of the enclosure to retain trapped HC and methanol. The check shall be conducted over a 24-hour period with all of the normally functioning subsystems of the enclosure active. A known mass of propane and/or methanol shall be injected into the enclosure and an initial enclosure mass measurement(s) shall be made. The enclosure shall be subjected to the temperature cycling specified in section III.D.10.3.7. of these procedures (revising 40 CFR §86.133-90(l)) for a 24 hour period. The temperature cycle shall begin at 105ºF (hour 11) and continue according to the schedule until a full 24-hour cycle is completed. A final enclosure mass measurement(s) shall be made. The following procedure shall be performed prior to the introduction of the enclosure into service and following any modifications or repairs to the enclosure that may impact the integrity of this enclosure; otherwise, the following procedure shall be performed on a monthly basis. (If six consecutive monthly retention checks are successfully completed without corrective action, the following procedure may be determined quarterly thereafter as long as no corrective action is required.)

1.1.3.1. Zero and span the HC analyzer.

1.1.3.2. Purge the enclosure until a stable enclosure HC level is attained.

1.1.3.3. Turn on the enclosure air mixing and temperature control system and adjust it for an initial temperature of 105.0^{o}F and a programmed temperature profile covering one diurnal cycle over a 24 hour period according to the profile specified in section III.D.10.3.7. of these procedures (revising 40 CFR §86.133-90). Close the enclosure door. On variable volume enclosures, latch the enclosure to the enclosure volume measured at 105^{o}F. On fixed volume enclosures, close the outlet and inlet flow streams.

1.1.3.4. When the enclosure temperature stabilizes at 105.0^{o}F ± 3.0^{o}F seal the enclosure; measure the enclosure background HC concentration (C_{HCe1}) and/or background methanol concentration (C_{CH3OH1}) and the temperature (T_1), and pressure (P_1) in the enclosure.

1.1.3.5. Inject into the enclosure a known quantity of propane between 2 to 6 grams and/or a known quantity of methanol in gaseous form between 2 to 6 grams. For evaporative emission enclosures that will be used for testing motor vehicles certified to the reduced evaporative standards in sections I.E.1.(c) and (d), use a known amount of propane or gaseous methanol between 0.5 to 1.0 grams. The injection method shall use a critical flow orifice to meter the propane and/or methanol at a measured temperature and pressure for a measured time period. Techniques which provide an accuracy and precision of ± 0.5 percent of the injected mass are also acceptable. Allow the enclosure internal HC and/or methanol concentration to mix and stabilize for up to 300 seconds. Measure the enclosure HC concentration (C_{HCe2}) and/or the enclosure methanol concentration (C_{CH3OH2}). For fixed volume enclosures, measure the temperature (T_2) and pressure in the enclosure (P_2). On variable volume enclosures, unlatch the enclosure. On fixed volume enclosures, open the outlet and inlet flow streams. Start the temperature cycling function of the enclosure air mixing and temperature control system. These steps shall be completed within 900 seconds of sealing the enclosure.

1.1.3.6. For fixed volume enclosures, calculate the initial recovered HC mass (M_{HCe1}) according to the following formula:

$$M_{HCe1} = (3.05 \text{ x } V \text{ x } 10^{-4} \text{ x } [P_2 (C_{HCe2} - rC_{CH3OH2})/T_2 - P_1 (C_{HCe1} - rC_{CH3OH1})/T_1])$$

where:

V is the enclosure volume at 105°F (ft^3)
P_1 is the enclosure initial pressure (inches Hg absolute)
P_2 is the enclosure final pressure (inches Hg absolute)
C_{HCen} is the enclosure HC concentration at event n (ppm C)
C_{CH3OHn} is the enclosure methanol concentration calculated according to 40 CFR §86.117-90 (d)(2)(iii) at event n (ppm C)
r is the FID response factor to methanol
T_1 is the enclosure initial temperature (°R)
T_2 is the enclosure final temperature (°R)

1.1.3.6.1. For variable volume enclosures, calculate the initial recovered HC mass and initial recovered methanol mass according to the equations used above except that P_2 and T_2 shall equal P_1 and T_1.

1.1.3.6.2. Calculate the initial recovered methanol mass (M_{CH3OH1}) according to 40 CFR §86.117-96(d)(1), as amended March 24, 1993.

1.1.3.6.3. If the recovered HC mass agrees with the injected mass within 2.0 percent and/or the recovered methanol mass agrees with the injected mass within 6.0 percent, continue the test for the 24-hour temperature cycling period. If the recovered mass differs from the injected mass by greater than the acceptable percentage(s) for HC and/or methanol, repeat the enclosure concentration measurement in section III.B.1.1.3.5. and recalculate the initial recovered HC mass (M_{HCe1}) and/or methanol mass (M_{CH3OH1}). If the recovered mass based on the latest concentration measurement agrees within the acceptable percentage(s) of the injected mass, continue the test for the 24-hour temperature cycling period and substitute this second enclosure concentration measurement for C_{HCe2} and/or C_{CH3OH2} in all subsequent calculations. In order to be a valid calibration, the final measurement of C_{HCe2} and C_{CH3OH2} shall be completed within the 900-second time limit outlined above. If the discrepancy persists, the test shall be terminated and the cause of the difference determined, followed by the correction of the problems(s) and the restart of the test.

1.1.3.7. At the completion of the 24 hour temperature cycling period, measure the final enclosure HC concentration (C_{HCe3}) and/or the final enclosure methanol concentration (C_{CH3OH3}). For fixed-volume enclosures, measure the final pressure (P_3) and final temperature (T_3) in the enclosure.

1.1.3.7.1. For fixed volume enclosures, calculate the final recovered HC mass (M_{HCe2}) as follows:

$$M_{HCe2} = [3.05 \text{ x } V \text{ x } 10^{-4} \text{ x}(P_3 (C_{HCe3} - rC_{CH3OH3})/T_3 - P_1 (C_{HCe1} - rC_{CH3OH1})/T_1)] + M_{HC,out} - M_{HC,\ in}$$

where:

V is the enclosure volume at 105^{o}F (ft^3)
P_1 is the enclosure initial pressure (inches Hg absolute)

P_3 is the enclosure final pressure (inches Hg absolute)
C_{HCe3} is the enclosure HC concentration at the end of the 24-hour temperature cycling period (ppm C)
C_{CH3OH3} is the enclosure methanol concentration at the end of the 24-hour temperature cycling period, calculated according to 40 CFR §86.117-90(d)(2)(iii) (ppm C)
r is the FID response factor to methanol
T_1 is the enclosure initial temperature (^oR)
T_3 is the enclosure final temperature (^oR)
$M_{HC,out}$ is mass of HC exiting the enclosure, (grams)
$M_{HC,in}$ is mass of HC entering the enclosure, (grams)

1.1.3.7.2. For variable volume enclosures, calculate the final recovered HC mass and final recovered methanol mass according to the equations used above except that P_3 and T_3 shall equal P_1 and T_1 , and $M_{HC, out}$ and $M_{HC, in}$ shall equal zero.

1.1.3.7.3. Calculate the final recovered methanol mass (M_{CH3OH2}) according to 40 CFR §86.117-96(d)(1), as amended March 24, 1993.

1.1.3.8. If the calculated final recovered HC mass for the enclosures is not within 3 percent of the initial enclosure mass or the calculated final recovered methanol mass for the enclosures is not within 6 percent of the initial enclosure mass, then action shall be required to correct the error to the acceptable level.

1.2. The running loss equipment shall be calibrated as follows:

1.2.1. The chassis dynamometer shall be calibrated according to the requirements of 40 CFR §86.118-78. The calibration shall be conducted at a typical ambient temperature of $75^oF \pm 5^oF$.

1.2.2. The running loss HC analyzer shall be calibrated according to the requirements of 40 CFR §86.121- 90.

1.2.3. If a point source facility is used, the running loss fuel vapor sampling system shall be calibrated according to the requirements of 40 CFR§86.119-90, with the additional requirement that the CVS System Verification in 40 CFR §86.119-90(c) be conducted by injecting the known quantity of propane into the inlet of the most frequently used fuel vapor collector configured to collect vapors from the source of the evaporative emission vapor storage canister. This procedure shall be conducted in the running loss test cell with the collector installed in a vehicle in the normal test configuration, except that the vent hose from the vehicle evaporative emission canister shall be routed to a ventilation outlet to avoid unrepresentative background HC concentration levels. The propane injection shall be conducted by injecting approximately 4 grams of propane into the collector while the vehicle is operated over one Urban Dynamometer Driving

Schedule (UDDS) test procedure, as described in 40 CFR §86.115-78 and Appendix I. The propane injection shall be conducted at a typical ambient temperature of 75°F ± 5°F.

1.2.4. In the event the running loss test is conducted using the atmospheric sampling measurement technique, the following procedure shall be used for the enclosure calibration:

1.2.4.1. The initial and periodic determination of enclosure background emissions shall be conducted according to the procedures specified in 40 CFR §86.117-90(a)(1) through (a)(6). The enclosure shall be maintained at a nominal temperature of 105.0°F throughout the four hour period. The allowable enclosure background emissions as calculated according to 40 CFR §86.117-90 (a)(7) shall not be greater than 0.2 grams in 4 hours. The enclosure may be sealed and the mixing fan operated for a period of up to 12 hours before the initial HC concentration reading is taken.

1.2.4.2. The initial determination of enclosure internal volume shall be performed according to the procedures specified in 40 CFR §86.117-90 (b).

1.2.4.3. The enclosure shall meet the calibration and retention requirements of 40 CFR §86.117-90(c). The propane injection recovery test shall be conducted with a test vehicle being driven over one UDDS cycle in the enclosure during the propane injection test. The vehicle used shall be configured and operated under conditions which ensure that its own running loss contribution is negligible, by using fuel of the lowest available volatility (7.0 psi RVP), maintaining the tank temperature at low levels (<100°F), and routing the canister vent to the outside of the enclosure.

1.2.5. Hot soak enclosure. The hot soak enclosure calibration consists of the following parts: initial and periodic determination of enclosure background emissions, initial determination of enclosure volume, and periodic HC and methanol retention check and calibration. The hot soak enclosure calibration shall be conducted according to the method specified in section III.B.1.1. with a retention check of 4 hours at 105°F or the method specified in section III.B.1.2.4. If the hot soak enclosure is also for diurnal testing, the 4 hour retention check at 105°F may be replaced by the 24 hour diurnal retention check.

1.2.6. Diurnal and hot soak enclosure HC analyzer. The HC analyzers used for measuring the diurnal and hot soak samples shall be calibrated according to the requirements of 40 CFR §86.121-90.

1.2.7. Other equipment. Other test equipment including temperature and pressure sensors and the associated amplifiers and recorders, flow measurement devices, and other instruments shall be calibrated and operated according to the manufacturer's specifications and recommendations, and good engineering practice.

C. Road Load Power, Test Weight, Inertia Weight Class, and Running Loss Fuel Tank Temperature Profile Determination

Amend 40 CFR §86.129-80 to include an additional section III.C.1. to read:

1. Determination of running loss test fuel tank temperature profile. The manufacturer shall establish for each combination of vehicle platform/powertrain/fuel tank submitted for certification a representative profile of fuel tank liquid and vapor temperature versus time to be used as the target temperature profile for the running loss evaporative emissions test drive cycle. If a vehicle has more than one fuel tank, a profile shall be established for each tank. If manufacturers use a vehicle model to develop a profile to represent multiple vehicle models, the vehicle model selected must have the greatest expected fuel liquid temperature and fuel vapor temperature increase during driving of all of the vehicle models it will represent. Manufacturers must select test vehicles with any available vehicle options that could increase fuel temperature during driving, such as any feature that limits underbody air flow. The profile shall be established by driving the vehicle on-road over the same driving schedule as is used for the running loss evaporative emissions test according to the following sequence:

1.1. The vehicle to be used for the fuel tank temperature profile determination shall be equipped with at least 2 thermocouples installed so as to provide a representative bulk liquid average fuel temperature. The specific placement of the thermocouples shall take into account the tank configuration and orientation and shall be along the major axis of the tank. The thermocouples shall not be placed within internal reservoirs or other locations which are thermally isolated from the bulk volume of the fuel. The thermocouples shall be placed at a vertical depth equivalent to the mid-volume of the liquid fuel at a fill level of 40 percent of nominal tank capacity. A third thermocouple, shall be installed in the approximate center of the vapor space of the fuel tank. A pressure transducer with a minimum precision and accuracy of ± 1.0 inches H_2O shall be connected to the vapor space of the fuel tank. A means of conveniently draining the fuel tank shall be provided. The vehicle shall be equipped with a driver's aid which shall be configured to provide the test driver with the desired UDDS vehicle speed versus time trace as defined in Part 86, Appendix I and with the desired NYCC vehicle speed versus time trace as defined in Part 86, Appendix I of the CFR, amended as of March 24, 1993, and the actual vehicle speed. Vehicle coolant temperature shall be monitored to ensure adequate vehicle coolant air to the radiator intake(s). A computer, data logger, or strip chart data recorder shall record the following parameters during the test run:

- Desired speed
- Actual speed

- Average liquid fuel temperature (T_{liq})
- Vapor space temperature (T_{vap})
- Vapor space pressure

1.1.1. The data recording system shall provide a time resolution of 1 second, and an accuracy of ± 1 mph, ± 2.0^{o}F, and ± 1.0 inches H_2O. The temperature and pressure signals may be recorded at intervals of up to 30 seconds.

1.2. The temperature profile determination shall be conducted during ambient conditions which include:

- ambient temperature above 95^{o}F and increasing or stable (± 2^{o}F)
- sunny or mostly sunny with a maximum cloud cover of 25 percent
- wind conditions calm to light with maximum sustained wind speeds of 15 mph; temporary gusts of wind between 15 and 25 mph may occur up to 5 percent of the total driving time
- road surface temperature (T_{sur}) at least 30^{o}F above T_{amb} or at least 135^{o}F, whichever is less

1.2.1. The track surface temperature shall be measured with an embedded sensor, a portable temperature probe, or an infrared pyrometer which can provide an accuracy of ± 2.0^{o}F. Temperatures must be measured on a surface representative of the surface where the vehicle is driven. The test shall be conducted on a track or other restricted access facility so that the speed versus time schedule can be maintained without undue safety risks.

1.2.2. Prior to the start of the profile generation, the fuel tank may be artificially heated to the ambient temperature to a maximum of 105^{o}F. The vehicle may be soaked in a temperature-controlled enclosure. Fans blowing ambient air may be used to help control fuel temperatures. Engine idling may not be used to control fuel temperatures. If the fuel tank is artificially heated, the liquid fuel temperature and the vapor temperature must be stabilized for at least one hour at the ambient temperature within ± 2^{o}F to a maximum of 105^{o}F before the profile generation begins. If the allowance for a lower initial fuel temperature established in section III.D.7. is used, the fuel in the test vehicle may not be stabilized at a temperature higher than the established lower initial temperature.

1.2.3. Tank pressure shall not exceed 10 inches of water 30 seconds after the start of the engine until the end of engine operation during the temperature profile determination unless a pressurized system is used and the manufacturer demonstrates in a separate test that vapor would not be vented to the atmosphere if the fuel fill pipe cap was removed at the end of the running loss fuel tank temperature profile determination.

1.3. The vehicle fuel tank shall be drained and filled to 40 percent of the nominal tank capacity with fuel meeting the requirements of section III.D.1. of these procedures. For all hybrid electric vehicles, except for 2012 and subsequent model-year off-vehicle charge capable hybrid electric vehicles, the battery state-of-charge shall be set at a level such that the auxiliary power unit would be activated by the vehicle's control strategy within 30 seconds of starting the first UDDS of the fuel tank temperature profile determination test sequence. If the auxiliary power unit is capable of being manually activated, the auxiliary power unit shall be manually activated at the beginning of and operating throughout the fuel tank temperature profile determination. For 2012 and subsequent model-year off-vehicle charge capable hybrid electric vehicles, the battery state-of-charge shall be set at the level that results when the battery state-of-charge is initially set at the highest level allowed by the manufacturer and then decreased, as applicable, by the performance of a standard three-phase exhaust test, The vehicle shall be moved to the location where the driving cycle is to be conducted. It may be driven a maximum distance of 5.0 miles, longer distances shall require that the vehicle be transported by other means. For 2012 and subsequent model-year off-vehicle charge capable hybrid electric vehicles, the vehicle shall be either only pushed or towed to avoid disturbing the battery state-of-charge setting. The vehicle shall be parked for a minimum of 12 hours in an open area on a surface that is representative of the test road. The orientation of the front of the vehicle during parking (N, SW, etc.) shall be documented. Once the 12-hour minimum parking time has been achieved and the ambient temperature and weather conditions and track surface temperature are within the allowable ranges, the vehicle engine shall be started. The vehicle air conditioning system (if so equipped) shall be set to the "NORMAL" air conditioning mode and adjusted to the minimum discharge air temperature and high fan speed. Vehicles equipped with automatic temperature controlled air conditioning systems shall be operated in "AUTOMATIC" temperature and fan modes with the system set at 72^{o}F. The vehicle may be operated at minimum throttle for periods up to 60 seconds prior to beginning the first UDDS cycle in order to move from the parking location onto the road surface. The driver's aid shall be started and the vehicle operated over one UDDS cycle, then two NYCCs, and another UDDS cycle. The end of each UDDS cycle and the end of the two NYCCs shall be followed by an idle period of 120 seconds during which the engine shall remain on with the vehicle in the same transmission range and clutch (if so equipped) actuation mode as specified in 40 CFR §86.128-79 except for the following:

> Revise subparagraph (c) to include: Idle modes may be run with automatic transmission in "Neutral" and shall be placed in "Drive" with the wheels braked at least 5 seconds before the end of the idle mode. Manual transmission may be in "Neutral" with the clutch engaged and shall be placed in gear with the clutch disengaged at least 5 seconds before the end of the idle mode.

1.3.1. The data recording system shall provide a record of the required parameters over the entire sequence from the initiation of the first UDDS cycle to the end of the third 120 second idle period. Following the completion of the test, the data recording system and driver's aid shall be turned off.

1.4. In addition to the vehicle data recording, the following parameters shall be documented for the running loss test fuel tank temperature determination:

- Date and time of vehicle fueling
- Odometer reading at vehicle fueling
- Date and time vehicle was parked and parking location and orientation
- Odometer reading at parking
- Time and temperature of fuel tank heating, if applicable
- Date and time engine was started
- Time of initiation of first UDDS cycle
- Time of completion of third 120 second idle period
- Ambient temperature and track surface temperature at initiation of first UDDS cycle (T_{amb1} and T_{sur1})
- Ambient temperature and track surface temperature at completion of third 120 second idle period (T_{amb2} and T_{sur2})

1.5. The two UDDS and two NYCC driving traces shall be verified to meet the speed tolerance requirements of 40 CFR 86.115-78 (b)(1), amended as follows:

1.5.1. Revise subparagraph (v) to read: When conducted to meet the requirements of 40 CFR §86.129, up to three additional occurrences of speed variations greater than the tolerance are acceptable, provided they occur for less than 15 seconds on any occasion. All speed variations must be clearly documented as to the time and speed at that point in relation to the driving schedule.

1.5.2. Add subparagraph (vi) to read: When conducted to meet the requirements of 40 CFR §86.129 and §86.132, the speed tolerance shall be as specified above, except that the upper and lower limits shall be 4 mph.

1.6. The following temperature conditions shall be verified:

$(T_{amb1}) \geq 95.0^{o}F$
$(T_{amb2}) \geq (T_{amb1} - 2.0^{o}F)$
$(T_{sur(n)} - T_{amb\,(n)}) \geq 30.0^{o}F$

where n is the incremental measurements in time.

or $T_{sur} > 135^{o}F$

1.7. Failure to comply with any of these requirements shall result in a void test, and require that the entire test procedure be repeated beginning with the fuel drain specified in section III.C.1.3.

1.8. If all of these requirements are met, the following calculations shall be performed:

$$T_{corr} = T_{(i)} - T_o$$

where: $T_{(i)}$ is the liquid fuel temperature (^oF) or vapor fuel temperature (^oF) during the drive where i is the incremental measurements in time.

T_o is the corresponding liquid fuel temperature (^oF) or vapor fuel temperature (^oF) observed at the start of the specified driving schedule

1.8.1. The individual tank liquid (T_{liq}) and vapor space (T_{vap}) temperatures recorded during the test run shall be adjusted by arithmetically adding the corresponding temperature correction (T_{corr}) adjustment calculated above to 105^{o}F. If T_o is higher than the corresponding ambient temperature by 2^{o}F, the temperature correction shall be determined by the above equation plus the difference in T_o and the corresponding ambient temperature.

1.9. Other methodologies for developing corrected liquid and vapor space temperature profiles are acceptable if approved in advance by the Executive Officer. The Executive Officer shall approve an alternate method if the manufacturer demonstrates equivalence to data collected at 105^{o}F.

D. Test Procedure

The test sequence described in 40 CFR §86.130 through §86.140 shall be performed with the following modifications:

1. General Requirements

1.0. The following language shall be applicable in lieu of 40 CFR §86.130-78:

1.1. The test sequence shown in Figure 2 (Figure 3A or 3B for hybrid electric vehicles) describes the steps encountered as the vehicle undergoes the three-day diurnal sequence and the supplemental two-day diurnal sequence to determine conformity with the standards set forth. Methanol measurements may be omitted when methanol-fueled vehicles will not be tested in the evaporative enclosure. Ethanol shall be accounted for via measurement or mass adjustment factor, using the methods described in this test procedure, for vehicles tested with the gasoline set forth in part II, section A.100.3.1.2. of the “California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles.” Ambient temperature levels encountered by the test vehicle throughout the entire duration of this test sequence shall not be less than 68^{o}F nor more than 86^{o}F, unless otherwise specified. The temperatures monitored during testing shall be representative of those experienced by the test vehicle. The test vehicle shall be approximately level during all phases of the test sequence to prevent abnormal fuel distribution. The temperature tolerance of a soak period may be waived for up to 10 minutes to allow purging of the enclosure or transporting the vehicle into the enclosure.

1.2. If tests are invalidated after collection of emission data from previous test segments, the test may be repeated to collect only those data points needed to complete emission measurements. Compliance with emission standards may be determined by combining emission measurements from these different test runs. If any emission measurements are repeated, the new measurements supersede previous values.

1.3. The three-day diurnal test sequence shown in Figure 2 (and Figure 3A or 3B for hybrid electric vehicles) is briefly described as follows:

1.3.1. For 2001 through 2008 model-year hybrid electric vehicles, the manufacturer may elect to perform the All-Electric Range Test (as indicated in Figure 3A or 3B, as applicable) pursuant to the "California Exhaust Emission Standards and Test Procedures for 2005 – 2008 Model Zero-Emission Vehicles, and 2001 – 2008 Model Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck, and Medium-Duty Vehicle Classes," prior to the initial fuel drain and fill step in this test sequence.

1.3.2. For 2009 and subsequent model-year hybrid electric vehicles, a manufacturer may elect to perform the All-Electric Range Test separately from the test sequences specified under these evaporative emission test procedures, and pursuant to the "California Exhaust Emission Standards and Test Procedures for 2009 and Subsequent Model Zero-Emission Vehicles and Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck, and Medium-Duty Vehicle Classes,"

1.4. For 2001 through 2011 model-year vehicles, the fuel tank shall be initially drained and filled to the prescribed tank fuel volume of 40 percent of the manufacturer’s nominal fuel tank capacity, as specified in 40 CFR §86.1803-01, in preparation for the vehicle preconditioning.

1.5. For 2001 through 2011 model-year vehicles, the vehicle preconditioning drive shall be performed in accordance with 40 CFR §86.132-90, except that following the initial fuel drain and fill step in this test sequence, as specified in 40 CFR §86.132-90(a)(1), an initial preconditioning soak period of a minimum of 6 hours shall be provided to allow the vehicle to stabilize to ambient temperature prior to the preconditioning drive. Vehicles performing consecutive tests at a test point with the same fuel specification and while remaining under laboratory ambient temperature conditions for at least 6 hours, may eliminate both the initial fuel drain and fill and vehicle soak. In such cases, each subsequent test shall begin with the preconditioning drive.

1.5.1. Following the vehicle preconditioning drive, a second fuel drain and fill step shall be performed, in accordance with 40 CFR §86.132-90(a)(1), The fuel tank shall be filled to the prescribed tank fuel volume of 40 percent of the manufacturer's nominal fuel tank capacity, as specified in 40 CFR §86.1803-01.

1.6. For 2012 and subsequent model-year vehicles, the vehicle preconditioning shall be performed in accordance with 40 CFR §86.132-00, except as amended by section III.D.3.

1.6.1. For a 2012 and subsequent model-year off-vehicle charge capable hybrid electric vehicle, the vehicle preconditioning drive shall include at least one complete UDDS performed entirely under a charge-sustaining mode of operation, The battery state-of-charge net change tolerance provisions specified in section F.10., of the "California Exhaust Emission Standards and Test Procedures for 2009 and Subsequent Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck, and Medium-Duty Vehicle Classes" shall not apply.

1.7. For 2012 and subsequent model-year off-vehicle charge capable hybrid electric vehicles that are equipped with non-integrated refueling canister-only systems, the following exceptions apply.

1.7.1. After completion of the vehicle preconditioning drive, the second fuel drain and tank refill step specified in 40 CFR §86.132-00(f)(1) shall be replaced by the 95% tank fill step specified in 40 CFR 86.153-98(d).

1.7.2. After completion of the second fuel drain and tank refill step, the initial testing state of the canister shall be established by purging while performing either the chassis dynamometer procedure or the test track procedure, as described in subparagraphs (d)(1) and (d)(2) of 40 CFR 86.153-98. For vehicles equipped with dual fuel tanks that can be individually selected or isolated, the required volume of fuel shall be driven out of one tank, the second tank shall be selected as the fuel source, and the required volume of fuel shall be driven out of the second tank. A manufacturer shall plan for interruptions in the vehicle drivedowns due to factors such as work schedules, driver relief, and test equipment considerations, using good engineering practice.

1.7.3. With advance Executive Officer approval, a manufacturer may optionally elect to bench purge the canister either during the initial soak period, specified in 40 CFR

§86.132-00(c)(1), or after the vehicle preconditioning drive step specified in section III.D.1.6.1., in lieu of performing the second fuel drain/fill and vehicle drivedown steps specified in sections III.D.1.7.1. and III.D.1.7.2. Approval by the Executive Officer shall be based upon assurance that the canister will be bench purged by an equivalent volume of air corresponding to a consumption of 85%, or less as determined by the manufacturer, of the manufacturers' nominal fuel tank capacity, and that the characteristics of the purge flow through the canister, such as flow rates, shall be representative of flow that occurs under the specified vehicle drivedown UDDS cycles. Within 60 minutes of completing the bench purging, the fuel drain and fill step specified in section III.D.1.7.4. shall be performed.

1.7.4. Within 60 minutes of completing the vehicle drivedown, a third fuel drain and fill step shall be performed in which the fuel tank shall be filled to a prescribed tank fuel volume of 10 percent of the manufacturer's nominal fuel tank capacity, determined to the nearest one-tenth of a U.S. gallon (0.38 liter) with the specified fuel. The manufacturer may isolate the canister using any method that does not compromise the integrity of the system. A description of the canister isolation method shall be included in the manufacturer's certification application. When the refueling canister is isolated from its system, fuel vapors shall be allowed to be vented from the fuel tank, as appropriate, during this fill step.

1.7.5 After completion of the third fuel drain and fill step, a second vehicle soak period of not less than 6 hours and not more than 24 hours shall be performed.

1.7.6. After completion of the second vehicle soak period, the fuel-tank-refill canister-loading step specified in section III.D.3.3.6. shall be performed.

1.7.7. After completion of the canister loading, a fourth drain and fill step shall be performed, as specified in section III.D.3.3.6.13.

1.7.8. After completion of the fourth drain and fill step, a third preconditioning soak period of not less than 12 hours and not more than 36 hours shall be performed.

1.7.9. After completion of the 12-to-36 hour preconditioning soak period, a test vehicle shall proceed to the exhaust emission test specified in section III.D.1.11.

1.7.10.When conducting only an exhaust emission test sequence, a manufacturer may elect to perform the canister preconditioning and loading method specified in sections III.D.1.9., III.D.1.10., and III.3.3.4., in lieu of the canister loading method specified in sections III.D.1.7.6. and III.D.3.3.6. Under such an election, the exceptions specified in sections III.D.1.7.4., III.D.1.7.5, and III.D.1.7.6. shall not apply.

1.7.10.1. The Executive Officer may elect to use either canister loading method when conducting exhaust emission testing for certification confirmatory testing and in-use compliance purposes.

1.8. A second preconditioning soak period of not less than 12 hours and not more than 36 hours shall be performed prior to the exhaust emission test.

1.9. During the 12-to-36 hour soak specified in section III.D.1.8 above, the vehicle's evaporative control canister shall be purged with a volume of air equivalent to 300 carbon canister bed volumes at a flow rate of 48 SCFH (22.7 slpm).

1.10. The evaporative control canister shall then be loaded using a butane-nitrogen mixture.

1.11. Perform exhaust emission tests in accordance with procedures as provided in “California 2001 through 2014 Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2009 through 2016 Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles,” the “California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles,” and these procedures.

1.12. For 2001 through 2008 model-year hybrid electric vehicles, a four-phase exhaust test shall be performed as shown in Figure 3A pursuant to the "California Exhaust Emission Standards and Test Procedures for 2005 – 2008 Model Zero-Emission Vehicles, and 2001 – 2008 Model Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck, and Medium-Duty Vehicle Classes."

1.12.1. For 2009 and subsequent model-year hybrid electric vehicles, a manufacturer may elect to perform the four-phase exhaust emission test separately from the test sequence specified under these evaporative emission test procedures, and pursuant to the "California Exhaust Emission Standards and Test Procedures for 2009 and Subsequent Model Zero-Emission Vehicles and Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck, and Medium-Duty Vehicle Classes."

1.12.2. When a four-phase exhaust test is performed with the evaporative emission test sequence as shown in Figure 3A, the evaporative emission test sequence shall begin at the second drain and fill step in the test sequence, after the four-phase exhaust test is completed. The ensuing standard three-phase exhaust test shall then be performed without exhaust emission sampling.

1.12.3. For 2001 through 2008 model-year hybrid electric vehicles, the four-phase exhaust testing may be performed in conjunction with evaporative testing, as shown in Figure 3B, with advance Executive Officer approval if the manufacturer is able to provide data demonstrating compliance with evaporative emission standards using the standard three-phase test.

1.12.4. For 2001 through 2008 model-year hybrid electric vehicles, battery state-of-charge setting prior to the standard three-phase test shall be performed pursuant to the supplemental requirements specified in section E.6.1.6. of the "California Exhaust Emission Standards and Test Procedures for 2005 – 2008 Model Zero-Emission Vehicles, and 2001 – 2008 Model Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck, and Medium-Duty Vehicle Classes."

1.12.5. For 2009 and subsequent model-year hybrid electric vehicles, except for 2012 and subsequent model-year off-vehicle charge capable hybrid electric vehicles, battery state-of-charge setting prior to the standard three-phase test shall be performed pursuant to the supplemental requirements specified in section E.6.1.5 of the "California Exhaust Emission Standards and Test Procedures for 2009 and Subsequent Model Zero-Emission Vehicles and Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck, and Medium-Duty Vehicle Classes."

1.12.6. For 2012 and subsequent model-year off-vehicle charge capable hybrid electric vehicles, battery state-of-charge setting prior to the standard three-phase test shall be at the highest level allowed by the manufacturer in order to eliminate or minimize the cumulative amount of the auxiliary power unit activation during either of the ensuing three-phase exhaust or running loss tests. This requirement shall be applicable regardless of a vehicle's ability to allow, or not to allow, manual activation of the auxiliary power unit. If off-vehicle charging is required to increase the battery state-of-charge for the proper setting, then this charging shall occur during the 12-to-36 hour soak period. The battery state-of-charge net change tolerance provisions specified in section F.10., of the "California Exhaust Emission Standards and Test Procedures for 2009 and Subsequent Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck, and Medium-Duty Vehicle Classes" shall not apply.

1.13. Upon completion of the hot start test, the vehicle shall be parked in a temperature controlled area between one to six hours to stabilize the fuel temperature at 105^{o}F for one hour. Artificial cooling or heating of the fuel tank may be induced to achieve a fuel temperature of 105^{o}F. The initial fuel and, if applicable, vapor temperatures for the running loss test may be less than 105^{o}F with advance Executive Order approval if the manufacturer is able to provide data demonstrating initial temperatures at least 3^{o}F lower than the required 105^{o}F starting temperature.

1.14. A running loss test shall be performed after the fuel tank is stabilized at 105^{o}F. The fuel tank temperature shall be controlled using a specified tank temperature profile for that vehicle during the test. The temperature profile shall be achieved either using temperature controllers or by an air management system that would simulate airflow conditions under the vehicle during driving.

1.15. The hot soak enclosure test shall then be performed at an enclosure ambient temperature of 105^{o}F.

1.16. Upon completion of the hot soak enclosure test, the vehicle shall be soaked for not less than 6 hours and not more than 36 hours. For at least the last 6 hours of this period, the vehicle shall be soaked at 65^{o}F.

1.17. A three-day diurnal test shall be performed in a variable temperature enclosure.

1.18. The supplemental two-day diurnal sequence in Figure 2 (and Figure 3A or 3B for hybrid electric vehicles) shall be conducted according to sections III.D.1.4. through III.D.1.17., with the following exceptions:

1.18.1. Sections III.D.1.9., III.D.1.12., III.D.1.13., and III.D.1.14., shall not apply,

1.18.2. In section III.D.1.15., the ambient temperature of the hot soak test is conducted at an ambient temperature between 68^{o}F and 86^{o}F at all times.

1.18.3. In section III.D.1.17., the diurnal test will consist of a two-day test.

1.18.4. For 2001 through 2008 model-year hybrid electric vehicles, battery state-of-charge setting prior to the standard three-phase exhaust test in the supplemental two-day diurnal test sequence shall be performed pursuant to the supplemental requirements specified in section E.6.1.6. of the "California Exhaust Emission Standards and Test Procedures for 2005 – 2008 Model Zero-Emission Vehicles, and 2001 – 2008 Model Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck, and Medium-Duty Vehicle Classes."

1.18.5. For 2009 and subsequent model-year hybrid electric vehicles, except for 2012 and subsequent model-year off-vehicle charge capable hybrid electric vehicles, battery state-of-charge setting prior to the standard three-phase test in the supplemental two-day diurnal test sequence shall be performed pursuant to the supplemental requirements specified in section E.6.1.5 of the “California Exhaust Emission Standards and Test Procedures for 2009 and Subsequent Model

Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck, and Medium-Duty Vehicle Classes."

1.18.6. For 2012 and subsequent model-year off-vehicle charge capable hybrid electric vehicles, battery state-of-charge setting prior to the standard three-phase exhaust test in the supplemental two-day diurnal sequence shall be at the highest level allowed by the manufacturer in order to eliminate or minimize the cumulative amount of the auxiliary power unit activation during either of the ensuing three-phase exhaust or running loss tests. This requirement shall be applicable regardless of a vehicle's ability to allow, or not to allow, manual activation of the auxiliary power unit. If off-vehicle charging is required to increase the battery state-of-charge for the proper setting, then this charging shall occur during the 12-to-36 hour soak period. The battery state-of-charge net change tolerance provisions specified in section F.10., of the "California Exhaust Emission Standards and Test Procedures for 2009 and Subsequent Model Zero-Emission Vehicles and Hybrid Electric Vehicles, In The Passenger Car, Light-Duty Truck, and Medium-Duty Vehicle Classes" shall not apply.

1.18.7. Emission sampling is not required for the standard three-phase exhaust test performed in the supplemental two-day diurnal test sequence shown in Figure 3A.

1.19. The Executive Officer may conduct certification confirmatory tests and in-use compliance tests of 2012 and subsequent off-vehicle charge capable hybrid electric vehicles using any of the following battery state-of-charge levels:

1.19.1. As specified in sections III.D.1.12.6. or III.D.1.18.6., as applicable.

1.19.2. At the lowest level allowed by the manufacturer.

1.19.3. At any level in-between the levels indicated by sections III.D.1.19.1. and III.D.1.19.2., above, if applicable.

2. Vehicle Preparation

2.0. Amend 40 CFR §86.131-90 to read:

2.1. Prepare the fuel tank(s) for recording the temperature(s) of the prescribed test fuel liquid and, if applicable, fuel vapor according to the requirements of section III.C.1.1. (40 CFR §86.129-80). Measurement of the fuel vapor temperature is optional. If vapor temperature is not measured, the measurement of the fuel tank pressure is not required.

2.2. If applicable, the vehicle shall be equipped with a pressure transducer to monitor the fuel tank headspace pressure during the test. The transducer shall have an accuracy and precision of ± 1.0 inches water.

2.3. Provide additional fittings and adapters, as required, to accommodate a fuel drain at the lowest point possible in the fuel tank(s) as installed on the vehicle.

2.4. Provide valving or other means to allow purging and loading of the evaporative emission canister(s). Special care shall be taken during this step not to alter normal functions of the fuel vapor system components.

2.5. For vehicles to be tested for running loss emissions, prepare the exhaust system by sealing and/or plugging all detectable sources of exhaust gas leaks. The exhaust system shall be tested or inspected to ensure that detectable exhaust hydrocarbons are not emitted into the running loss enclosure during the running loss test.

3. Vehicle Preconditioning

3.1.1. For supplemental vehicle preconditioning requirements for 2001 through 2008 model-year hybrid electric vehicles, refer to the "California Exhaust Emission Standards and Test Procedures for 2005 – 2008 Model Zero-Emission Vehicles, and 2001 – 2008 Model Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck, and Medium-Duty Vehicle Classes."

3.1.2. For supplemental vehicle preconditioning requirements for 2009 and subsequent model-year hybrid electric vehicles, refer to the "California Exhaust Emission Standards and Test Procedures for 2009 and Subsequent Model Zero-Emission Vehicles and Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck, and Medium-Duty Vehicle Classes."

3.2. The following language shall be applicable in lieu of 40 CFR §86.132-90(a)(4) for 2001 through 2011 model-year vehicles; and, in lieu of 40 CFR §86.132-00(e) for 2012 and subsequent model-year vehicles.

The Executive Officer may also choose to conduct or require the performance of optional or additional preconditioning to ensure that the evaporative emission control system is subjected to conditions typical of normal driving. The optional preconditioning shall consist of no less than 20 and no more than 50 miles of on-road mileage accumulation under typical driving conditions.

3.3. The following language shall be applicable in lieu of 40 CFR §86.132-90(b) for 2001 through 2011 model-year vehicles. For 2012 and subsequent model-year vehicles, the vehicle preconditioning shall be performed in accordance with 40 CFR §86.132-00(f) through (j), except when amended by the following language.

3.3.1. Within five minutes of completion of vehicle preconditioning drive, the vehicle shall be driven off the dynamometer to a work area. For hybrid electric vehicles following battery state-of-charge setting, the vehicle shall only be pushed or towed to avoid disturbing the battery state-of-charge setting.

3.3.2. Except for 2012 and subsequent model-year off-vehicle charge capable hybrid electric vehicles that are equipped with non-integrated refueling canister-only systems, the fuel tank(s) of the prepared vehicle shall undergo the second fuel drain and fill step of the test sequence, with the applicable test fuel, as specified in section III.F. of these procedures, to the prescribed tank fuel volume of 40 percent of the manufacturer's nominal fuel tank capacity, as defined in 40 CFR §86.1803-01. The vehicle shall be refueled within 1 hour of completion of the preconditioning drive.

3.3.2.1. For 2012 and subsequent model-year off-vehicle charge capable hybrid electric vehicles that are equipped with non-integrated refueling canister-only systems, the exceptions specified in sections III.D.1.7.1 through III.D.1.7.10., shall apply, along with the applicable test fuel specified in section III.F.

3.3.3. Following the second fuel drain and fill described in section III.D.3.3.2. above, the test vehicle shall be allowed to soak for a period of not less than 12 and not more than 36 hours prior to the exhaust emissions test. Except for 2012 and subsequent model-year off-vehicle charge capable hybrid electric vehicles that are equipped with non-integrated refueling canister-only systems, during the soak period, the canister shall be connected to a pump or compressor and loaded with butane as described in section III.D.3.3.4. below for the three-day diurnal sequence and in section III.D.3.3.5. below for the supplemental two-day diurnal sequence. For all vehicles subjected to exhaust emissions testing only, the canister loading procedure as set forth in section III.D. 3.3.4. below shall be used. For 2012 and subsequent model-year off-vehicle charge capable hybrid electric vehicles that are equipped with non-integrated refueling canister-only systems, the canister shall be loaded according to the fuel-tank-refill canister-loading method specified in section III.D.3.3.6., for both the three-day diurnal sequence and the supplemental two-day diurnal sequence.

3.3.3.1. For methanol-fueled and flexible-fueled vehicles, canister preconditioning shall be performed with a fuel vapor composition representative of that which the vehicle would generate with the fuel mixture used for the current test. Manufacturers shall develop a procedure to precondition the canister, if the vehicle is so equipped for the different fuel. The procedure shall represent a canister loading equivalent to that specified in section III.D.3.3.4. below for the three-day diurnal sequence and in section III.D.3.3.5. below for the supplemental two-day diurnal sequence and shall be approved in advance by the Executive Officer.

3.3.4. For the three-day diurnal sequence, the evaporative emissions storage canister(s) shall be preloaded with an amount of butane equivalent to 1.5 times the nominal working capacity. For vehicles with multiple canisters in a series configuration, the set of canisters must be preconditioned as a unit. For vehicles with multiple canisters in a parallel configuration, each canister shall be preconditioned separately. For vehicles equipped with a non-integrated refueling emission control system, the non-integrated canisters shall be preconditioned for the three-day diurnal test sequence according to the procedure in section III.D.3.3.5.1. All 2012 and subsequent model-year off-vehicle charge capable hybrid electric vehicles equipped with non-integrated refueling canister-only systems shall be preconditioned for the three-day diurnal test sequence according to the procedure specified in section III.D.3.3.6., unless a manufacturer is conducting only an exhaust emission test sequence, in which case the optional canister preconditioning and loading method allowed by section III.D.1.7.10. may apply. If a vehicle is designed to actively control evaporative or refueling emissions without a canister, the manufacturer shall devise an appropriate preconditioning procedure subject to the approval of the Executive Officer. If canisters on both certification and production vehicles are equipped with purge and load service ports, the service port shall be used for the canister preconditioning. The nominal working capacity of a carbon canister shall be established by determining the mass of butane required to load a stabilized canister to a 2-gram breakthrough. The 2-gram breakthrough is defined as the point at which the cumulative quantity of hydrocarbons emitted is equal to 2 grams, as defined in section I.B.1.3. The determination of nominal capacity shall be based on the average capacity of no less than five canisters which are in a stabilized condition. For stabilization, each canister must be cycled no less than 10 times and no more than 100 times to a 2-gram breakthrough with a 50/50 mixture by volume of butane and nitrogen, at a rate of 15 ± 2 grams butane per hour. Each canister loading step must be preceded by canister purging with 300 canister bed volume exchanges at 48 SCFH. The following procedure shall be used to preload the canister:

3.3.4.1. Prepare the evaporative emission canister(s) for the canister purging and loading operation. The canister shall not be removed from the vehicle, unless access to the canister in its normal location is so restricted that purging and loading can only reasonably be accomplished by removing the canister from the vehicle. Special care shall be taken during this step so that the normal functions of the fuel system components or the normal pressure relationships in the system are not disturbed. The canister purge shall be performed with ambient air of controlled humidity to 50 ± 25 grains per pound of dry air. This may be accomplished by purging the canister in a room which is conditioned to this level of absolute humidity. The flow rate of the purge air shall be maintained at a nominal flow rate of 48 SCFH (22.7 slpm), and the duration shall be determined to provide a total purge volume flow through the canister equivalent to 300 carbon canister bed volume exchanges.

3.3.4.1.2. The evaporative emission canister(s) shall then be loaded with an amount of commercial grade butane vapors equivalent to 1.5 times the nominal working capacity. Canister loading shall not be less than 1.5 times the nominal canister capacity. The canister shall be loaded with a mixture composed of 50 percent butane and 50 percent nitrogen by volume. The butane shall be loaded into the canister at a rate of 15 ± 2 grams of butane per hour. If the canister loading at this rate takes longer than 12 hours, a manufacturer may determine a new rate, based on completing the canister loading in no less than 12 hours. A Critical Flow Orifice (CFO) butane injection device, a gravimetric method, or electronic mass flow controllers shall be used to fulfill the requirements of this step. The time of completion of the canister loading activity shall be recorded. Manufacturers shall disclose to the Executive Officer their canister loading procedure. The protocol may not allow for the replacement of components. In addition, the Executive Officer may require that the manufacturer demonstrate that the procedure does not unduly disturb the components of the evaporative system.

3.3.4.1.3. Reconnect the evaporative emission canister(s), if applicable.

3.3.5. For the supplemental two-day diurnal sequence, the evaporative emission storage canister(s) shall be loaded to the point of breakthrough using the method specific in either section III.D.3.3.5.1. or section III.D.3.3.5.2. For vehicles with multiple canisters in a series configuration, the set of canisters must be preconditioned as a unit. For vehicles with multiple canisters in a parallel configuration, each canister shall be preconditioned separately. For vehicles equipped with a non-integrated refueling emission control system, the non-integrated canisters shall be preconditioned for the supplemental two-diurnal test sequence according to the procedure in section III.D.3.3.5.1. Breakthrough may be determined by emission measurement in an enclosure or by measuring the weight gain of an auxiliary evaporative canister connected downstream of the vehicle's canister, in which case, the following references to the enclosure can be ignored. The auxiliary canister shall be well purged with ambient air of humidity controlled to 50±25 grains per pound of dry air prior to loading. Breakthrough is defined as the point at which the cumulative quantity of hydrocarbons emitted is equal to 2 grams, as defined in section I.B.1.3.

3.3.5.1. The following procedure provides for loading of the canister to breakthrough with a mixture composed of 50 percent butane and 50 percent nitrogen by volume. If the canisters on both certification and production vehicles are equipped with purge and load service ports, the service port shall be used for the canister preconditioning.

3.3.5.1.1. Prepare the evaporative/refueling emission canister(s) for the canister loading operation. The canister shall not be removed from the vehicle, unless access to the canister in its normal location is so restricted that loading can only reasonably be accomplished by removing the canister from the vehicle. Special care shall be taken during this step to avoid damage to the components and the integrity of the fuel system. The evaporative emission enclosure shall be purged for several minutes. The FID hydrocarbon analyzer shall be zeroed and spanned immediately prior to the canister loading procedure. If not already on, the evaporative enclosure mixing fan shall be turned on at this time. Place the vehicle in the sealed enclosure and measure emissions with the FID.

3.3.5.1.2. Load the canister with a mixture composed of 50/50 mixture by volume of butane and nitrogen at a rate of 40 ± 2 grams butane per hour. As soon as the canister reaches breakthrough, the vapor source shall be shut off.

3.3.5.1.3. Reconnect the evaporative/refueling emission canister, if applicable.

3.3.5.2. The following procedure provides for loading the canister with repeated diurnal heat builds to breakthrough.

3.3.5.2.1. The evaporative emission enclosure shall be purged for several minutes. The FID hydrocarbon analyzer shall be zeroed and spanned immediately prior to the diurnal heat builds. If not already on, the evaporative enclosure mixing fan shall be turned on at this time. The average temperature of the dispensed fuel shall be 60 ± 12^{o}F. Within one hour of being refueled, the vehicle shall be placed, with the engine shut off, in the evaporative emission enclosure. The fuel tank temperature sensor shall be connected to the temperature recording system. A heat source, specified in 40 CFR §86.107-90(a)(4), shall be properly positioned with respect to the fuel tank(s) and connected to the temperature controller.

3.3.5.2.2. The fuel may be artificially heated or cooled to the starting diurnal temperature of 65^{o}F. Turn off purge blower (if not already off); close and seal enclosure doors; and initiate measurement of the hydrocarbon level in the enclosure. When the fuel temperature reaches 65^{o}F, start the diurnal heat build. The diurnal heat build should conform to the following function to within ± 4^{o}F:

$$F = T_o \pm 0.4t$$

F is the fuel temperature, ^{o}F
T_o is the initial temperature, ^{o}F
t is the time since beginning of test, minutes

3.3.5.2.3. As soon as breakthrough occurs or when the fuel temperature reaches 105^{o}F, whichever occurs first, the heat source shall be turned off, the enclosure doors shall be unsealed and opened. If breakthrough has not occurred by the time the fuel temperature reaches 105^{o}F, the heat source shall be removed from the vehicle, the vehicle shall be removed (with the engine still off) from the evaporative emission enclosure and the entire procedure outlined above shall be repeated until breakthrough occurs.

3.3.5.2.4. After breakthrough occurs, the fuel tank(s) of the prepared vehicle shall be drained and filled with test fuel, as specified in section III.F. of these procedures, to the "tank fuel volume" defined in 40 CFR §86.1803-01. The fuel shall be stabilized to a temperature within ± 3^{o}F of the lab ambient temperature before beginning the driving cycle for the exhaust emission test.

3.3.6. After the soak period specified in section III.D.1.7.5., is completed, the canister for a 2012 and subsequent model-year off-vehicle charge capable hybrid electric vehicle equipped with a non-integrated refueling canister-only system shall be preconditioned and loaded according to the following steps. Prior to conducting the applicable test sequence, the canister shall have already achieved a stabilized state, such as is accomplished using the stabilization method described in section III.D.3.3.4. Good engineering practice and safety considerations, such as, but not limited to, adequate ventilation and appropriate electrical groundings, shall apply.

3.3.6.1. Ambient temperature levels encountered by the test vehicle throughout these steps shall not be less than 68ºF (20ºC) or more than 86ºF (30ºC).

3.3.6.2. The test vehicle shall be approximately level, during the performance of these steps, to prevent abnormal fuel distribution.

3.3.6.3. In order to be moved, the test vehicle shall be pushed, as necessary, without starting its engine, throughout the performance of these steps.

3.3.6.4. The test vehicle shall be allowed to soak for a minimum of 6 hours and a maximum of 24 hours, at 80ºF ±3ºF (27ºC ±1.7ºC), prior to starting the fuel-tank-fill canister-loading step. The refueling canister shall remain isolated from its system during this soak period, in order to prevent any abnormal purging or loading of it during this soak period.

3.3.6.5. The refueling canister shall not be isolated from its system during the fuel-tank-refill canister-loading step.

3.3.6.6. The test vehicle's fuel fill pipe cap shall be removed.

3.3.6.7. The dispensed fuel temperature recording system shall be started.

3.3.6.8. The fuel nozzle shall be inserted into the fill pipe neck of the test vehicle, to its maximum penetration, and the refueling operation shall start. The plane of the nozzle's handle shall be approximately perpendicular to the floor. The fuel shall be dispensed at a temperature of 67ºF ±3.0ºF (19.4ºC ±1.7ºC), and at a dispensing rate of 9.8 gal/min ±0.3 gal/min (37.1 liter/min ±1.1 liter/min). When this refueling operation is conducted by the Executive Officer, a dispensing rate that is not less than 4.0 gal/min (15.1 liter/min) may be used.

3.3.6.9. The fuel flow shall continue until the refueling nozzle automatic shut-off is activated. The amount of fuel dispensed must be at least 85 percent of the nominal fuel tank volume, determined to the nearest one-tenth of a U.S. gallon (0.38 liter). If an automatic nozzle shut-off occurs prior to this point, the dispensing shall be reactivated within 15 seconds, and fuel dispensing continued as needed. A minimum of 3 seconds shall elapse between any automatic nozzle shutoff and the subsequent resumption of fuel dispensing.

3.3.6.10. As soon as possible after completing the refilling step, remove the fuel nozzle from the fill pipe neck, and replace the test vehicle’s fuel fill pipe cap.

3.3.6.11. The refueling canister shall be isolated from its system as soon as possible after completing the refilling step.

3.3.6.12. For vehicles equipped with more than one fuel tank, the steps described in this section shall be performed for each fuel tank.

3.3.6.13. After the fuel-tank-refill canister-loading process is completed, a fourth fuel drain and fill step shall be performed. The fuel tank shall be filled to the prescribed fuel thank volume of 40 percent of the manufacturer’s nominal fuel tank capacity, as specified in 40 CFR §86.1803-01. When the refueling canister is isolated from its system, fuel vapors shall be allowed to be vented out of the fuel tank, as appropriate, during this refilling step. The required fuel tank volume of 40 percent may be accomplished by using a measured drain of the fuel tank, in place of the specified complete fuel tank drain and fill step.

3.3.6.14. Upon completion of the fourth fuel drain and fill step, the test vehicle shall proceed to the 12-to-36 hour preconditioning soak step which is performed prior to the three-phase exhaust cold start test step. The canister shall not be isolated from its system during this soak step, and shall not be isolated from its system from this point onward in the test sequence.

3.3.6.15. The Executive Officer may approve modifications to this fuel-tank-refill canister-loading method when such modifications are supported by good engineering judgment, and do not reduce the stringency of the method.

3.4. As allowed under the provisions of section III.G. of these test procedures, a manufacturer may propose, for Executive Officer approval, the use of an alternative method to precondition canisters in lieu of the methods required under sections III.D.3.3.4.; III.D.3.3.5.1.; and, III.D.3.3.5.2., and III.D.3.3.6. The Executive Officer may conduct certification confirmatory tests and in-use compliance tests with the either the alternative canister loading method or the methods specified in sections III.D.3.3.4; III.D.3.3.5.1.; III.D.3.3.5.2.; and, III.D.3.3.6, as applicable.

4. Dynamometer Procedure.

4.1. To be conducted according to 40 CFR §86.135-90 (December 8, 2005).

4.2. For 2001 through 2008 model-year hybrid electric vehicles, the dynamometer procedure shall be performed pursuant to the "California Exhaust Emission Standards and Test Procedures for 2005 – 2008 Model Zero-Emission Vehicles, and 2001 – 2008 Model Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck, and Medium-Duty Vehicle Classes."

4.3. For 2009 and subsequent model-year hybrid electric vehicles, the dynamometer procedure shall be performed pursuant to the "California Exhaust Emission Standards and Test Procedures for 2009 Subsequent Model Zero-Emission Vehicles and Model Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck, and Medium-Duty Vehicle Classes."

5. Engine Starting and Restarting.

5.1. Amend 40 CFR §86.136-90 to read as follows:

5.1.1. Revise subparagraph (c) to read: Except for hybrid electric vehicles, if the vehicle does not start after the manufacturer's recommended cranking time (or 10 continuous seconds in the absence of a manufacturer's recommendation), cranking shall cease for the period recommended by the manufacturer (or 10 seconds in the absence of a manufacturer's recommendation). This may be repeated for up to three start attempts. If the vehicle does not start after three attempts, the reason for failure to start shall be determined. The gas flow measuring device on the CVS (usually a revolution counter) or CFV shall be turned off and the sampler selector valves, including the alcohol sampler, placed in the "standby" position during this diagnostic period. In addition, either the CVS should be turned off, or the exhaust tube disconnected from the tailpipe during the diagnostic period. If failure to start is an operational error, the vehicle shall be rescheduled for testing from a cold start.

6. Dynamometer Test Run, Gaseous and Particulate Emissions.

6.1. To be conducted according to 40 CFR §86.137-90.

6.2. For 2001 through 2008 model-year hybrid electric vehicles, the dynamometer test run, gaseous and particulate emissions shall be performed pursuant to the "California Exhaust Emission Standards and Test Procedures for 2005 – 2008 Model Zero-Emission Vehicles, and 2001 – 2008 Model Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck, and Medium-Duty Vehicle Classes."

6.3. For 2009 and subsequent model-year hybrid electric vehicles, the dynamometer test run, gaseous and particulate emissions shall be performed pursuant to the "California Exhaust Emission Standards and Test Procedures for 2009 and Subsequent Model Zero-Emission Vehicles and Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck, and Medium-Duty Vehicle Classes."

7. Vehicle Fuel Tank Temperature Stabilization

7.1. Immediately after the hot transient exhaust emission test, the vehicle shall be soaked in a temperature controlled area between one hour to six hours, until the fuel and, if applicable, vapor temperatures are stabilized at $105^oF \pm 3^oF$ for one hour. This is a preparatory step for the running loss test. Cooling or heating of the fuel tank may be induced to bring the fuel to 105^oF. The fuel heating rate shall not exceed 5^oF in any 1-hour interval. Higher fuel heating rates are allowed with Executive Officer approval if the 5^oF per hour heating rate is insufficient to heat the fuel to 105^oF in the allowed soak time. The vehicle fuel temperature stabilization step may be omitted on vehicles whose tank fuel and, if applicable, vapor temperatures are already at 105^oF upon completion of the exhaust emission test.

7.2. The initial fuel and, if applicable, vapor temperatures for the running loss test may be less than 105^oF with advance Executive Officer approval if the manufacturer is able to provide data justifying initial temperatures at least 3^oF lower than the required 105^oF starting temperature. The test data shall include the maximum fuel temperatures experienced by the vehicle during an extended parking event and after a UDDS cycle and be conducted on a day which meets the ambient conditions specified in section III.C.1.2., except the ambient temperature must be at least 105^oF. During the profile generation, the temperature offset shall apply.

7.3. The vehicle air conditioning system (if so equipped) shall be set to the "NORMAL" air conditioning mode and adjusted to the minimum discharge air temperature and high fan speed. Vehicles equipped with automatic temperature controlled air conditioning systems shall be operated in "AUTOMATIC" temperature and fan modes with the system set at 72°F.

8. Running Loss Test

8.0. After the fuel temperature is stabilized at 105°F or at the temperature specified by the manufacturer, the running loss test shall be performed. During the test, the running loss measurement enclosure shall be maintained at 105°F ± 5°F maximum and within ± 2°F on average throughout the running loss test sequence. Control of the vapor temperature throughout the test to follow the vapor temperature profile generated according to the procedures in section III.C. is optional. In those instances where vapor temperature is not controlled to follow the profile, the measurement of the fuel tank pressure is not required, and sections III.D.8.1.10. and III.D.8.2.5. below shall not apply. In the event that a vehicle exceeds the applicable emission standard during confirmatory testing or in-use compliance testing, and the vapor temperature was not controlled, the manufacturer may, utilizing its own resources, test the vehicle to demonstrate if the excess emissions are attributable to inadequate control of vapor temperature. If the vehicle has more than one fuel tank, the fuel temperature in each tank shall follow the profile generated in section III.C. If a warning light or gauge indicates that the vehicle's engine coolant has overheated, the test run may be stopped.

8.1. If running loss testing is conducted using an enclosure which incorporates atmospheric sampling equipment, the manufacturer shall perform the following steps for each test:

8.1.1. The running loss enclosure shall be purged for several minutes immediately prior to the test. If at any time the concentration of hydrocarbons, of alcohol, or of alcohol and hydrocarbons exceeds 15,000 ppm C, the enclosure should be immediately purged. This concentration provides at least a 4:1 safety factor against the lean flammability limit.

8.1.2. Place the drive wheels of the vehicle on the dynamometer without starting the engine.

8.1.3. Attach the exhaust tube to the vehicle tailpipe(s).

8.1.4. The test vehicle windows and the luggage compartments shall be closed.

8.1.5. The fuel tank temperature sensor and the ambient temperature sensor shall be connected to the temperature recording system and, if required, to the air management and temperature controllers. The vehicle cooling fan shall be positioned as described in 40 CFR §86.135-90(b). During the running loss test, the cover of the vehicle engine compartment shall be closed as much as possible, windows shall be closed, and air conditioning system (if so equipped) shall be operated according to the requirements of section III.C. (§86.129-80 (d)(3)). Vehicle coolant temperature shall be monitored to ensure adequate vehicle coolant air to the radiator intake(s). The temperature recording system and the hydrocarbon and alcohol emission data recording system shall be started.

8.1.6. Close and seal enclosure doors.

8.1.7. When the ambient temperature is 105°F ± 5°F, the running loss test shall begin. Analyze enclosure atmosphere for hydrocarbons and alcohol at the beginning of each phase of the test (i.e., each UDDS and 120 second idle; the two NYCCs and 120 second idle) and record. This is the background hydrocarbon concentration, herein denoted as $C_{HCa(n)}$ for each phase of the test and the background methanol concentration, herein denoted as $C_{CH3OHa(n)}$ for each phase of the test. The methanol sampling must start simultaneously with the initiation of the hydrocarbon analysis and continue for 4.0 ± 0.5 minutes. Record the time elapsed during this analysis. If the 4 minute sample period is inadequate to collect a sample of sufficient concentration to allow accurate Gas Chromatography analysis, rapidly collect the methanol sample in a bag and then bubble the bag sample through the impingers at the specified flow rate. The time elapsed between collection of the bag sample and flow through the impingers should be minimized to prevent any losses.

8.1.8. The vehicle shall be driven through one UDDS, then two NYCCs and followed by one UDDS. Each UDDS and the NYCC driving trace shall be verified to meet the speed tolerance requirements of 40 CFR §86.115-78 (b) as modified by III.C. The end of each UDDS cycle and the two NYCCs shall be followed by an idle period of 120 seconds during which the engine shall remain on with the vehicle in the same transmission range and clutch (if so equipped) actuation mode as specified in §86.128-79, modified by section III.C.1.3.

8.1.8.1. The fuel tank liquid temperature during the dynamometer drive shall be controlled within ± 3°F of the fuel tank temperature profile obtained on the road according to the procedures in section III.C. (40 CFR §86.129-80) for the same vehicle platform/powertrain/fuel tank configuration. If applicable, the fuel tank vapor temperature throughout the running loss test shall agree with the corresponding vapor temperature with a tolerance of ± 5°F. A running loss test with a fuel tank vapor temperature that exceeded the corresponding vapor temperature profile by more than the ± 5°F tolerance may be considered valid if test results comply with the applicable running loss evaporative emission standards. In addition, the fuel tank vapor temperature during the final 120 second idle period shall agree with the corresponding vapor temperature from the on-road profile within ± 3°F. For testing conducted by the Executive Officer, vapor temperatures may be cooler than the specified tolerances without invalidating test results. The fuel tank temperatures shall be monitored at a frequency of at least once every 15 seconds.

8.1.9. For engine starting and restarting, the provisions of §86.136-90(a) and (e) shall apply. If the vehicle does not start after the manufacturer's recommended cranking time or 10 continuous seconds in the absence of a manufacturer's recommendation, cranking shall cease for the period recommended by the manufacturer or 10 seconds in the absence of a manufacturer's recommendation. This may be repeated for up to three start attempts. If the vehicle does not start after these three attempts, cranking shall cease and the reason for failure to start shall be determined. If the failure is caused by a vehicle malfunction, corrective action of less than 30 minutes duration may be taken (according to 40 CFR §86.1830-01), and the test continued, provided that the ambient conditions to which the vehicle is exposed are maintained at $105^{o}F \pm 5^{o}F$. When the engine starts, the timing sequence of the driving schedule shall begin. If the vehicle cannot be started, the test shall be voided.

8.1.10. Tank pressure shall not exceed 10 inches of water during the running loss test unless a pressurized system is used and the manufacturer demonstrates in a separate test that vapor would not be vented to the atmosphere if the fuel fill pipe cap was removed at the end of the test. For 2012 and subsequent model-year off-vehicle charge capable hybrid electric vehicles that are equipped with non-integrated refueling canister-only systems, a manufacturer shall demonstrate in either a separate test or an engineering evaluation, that vapor would not be vented to the atmosphere if the fuel fill pipe cap was removed at the end of the test. Transitory incidents of the pressure exceeding 10 inches of water, not greater than 10 percent of the total driving time, shall be acceptable during the running loss test if the manufacturer can demonstrate that the tank pressure does not exceed 10 inches of water during in-use operation. No pressure checks of the evaporative system shall be allowed. If the manufacturer suspects faulty or malfunctioning instrumentation, a repair of the test instrumentation may be performed. Under no circumstances will any changes/repairs to the evaporative emissions control system be allowed.

8.1.11. The FID hydrocarbon analyzer shall be zeroed and spanned immediately prior to the end of each phase of the test.

8.1.12. Analyze the enclosure atmosphere for hydrocarbons and for alcohol following each phase. This is the sample hydrocarbon concentration, herein denoted as $C_{HCs(n)}$ for each phase of the test and the sample alcohol concentration, herein denoted as $C_{CH3OHs\ (n)}$ for each phase of the test. The sample hydrocarbon and alcohol concentration for a particular phase of the test shall serve as the background concentration for the next phase of the test. The running loss test ends with completion of the final 120 second idle and occurs 72 ± 2 minutes after the test begins. The elapsed time of this analysis shall be recorded.

8.1.13. Turn off the vehicle cooling fan and the vehicle underbody fan if used. The test vehicle windows and luggage compartment shall be opened. This is a preparatory step for the hot soak evaporative emission test.

8.1.14. The technician may now leave the enclosure through one of the enclosure doors. The enclosure door shall be open no longer than necessary for the technician to leave.

8.2. If running loss testing is conducted using a cell which incorporates point source sampling equipment, the manufacturer shall perform the following steps for each test:

8.2.1. The running loss test shall be conducted in a test cell meeting the specifications of 40 CFR §86.107-90 (a)(1) as modified by section III.A.2. of these procedures. Ambient temperature in the running loss test cell shall be maintained at 105 ± 5°F maximum and within ± 2°F on average throughout the running loss test sequence. The ambient test cell temperature shall be measured in the vicinity of the vehicle cooling fan, and it shall be monitored at a frequency of at least once every 15 seconds. The vehicle running loss collection system and underbody cooling apparatus (if applicable) shall be positioned and connected. The vehicle shall be allowed to re-stabilize until the liquid fuel tank temperature is within ± 3.0°F of the initial liquid fuel temperature calculated according to section III.C.1.5. (40 CFR §86.129-80) before the running loss test may proceed.

8.2.2. The vehicle cooling fan shall be positioned as described in 40 CFR §86.135-90(b). During the running loss test, the cover of the vehicle engine compartment shall be closed as much as possible, windows shall be closed, and air conditioning system (if so equipped) shall be operated according to the requirements of section III.C.1.3. (40 CFR §86.129-80). Vehicle coolant temperature shall be monitored to ensure adequate vehicle coolant air to the radiator intake(s).

8.2.3. The vehicle shall be operated on the dynamometer over one UDDS, two NYCCs, and one UDDS. Each UDDS and NYCC driving trace shall be verified to meet the speed tolerance requirements of 40 CFR §86.115-78 (b) as modified by section III.C. Idle periods of 120 seconds shall be added to the end of each of the UDDS and to the end of the two NYCCs. The transmission may be operated according to the specifications of 40 CFR §86.128-79 as modified by section III.C.1.3. Engine starting and restarting shall be conducted according to section III.D.8.1.9.

8.2.4. The fuel tank liquid temperature during the dynamometer drive shall be controlled within ± 3°F of the fuel tank liquid temperature profile obtained on the road according to the procedures in section III.C. (40 CFR §86.129-80) for the same vehicle platform/powertrain/fuel tank configuration. If applicable, the fuel tank vapor temperature throughout the running loss test shall agree with the corresponding vapor temperature with a tolerance of ± 5°F. A running loss test with a fuel tank vapor temperature that exceeded the corresponding vapor temperature profile by more than the ± 5°F tolerance may be considered valid if test results comply with the applicable running loss evaporative emission standards. In addition, the fuel tank vapor temperature during the final 120 second idle period shall agree with the corresponding vapor temperature from the on-road profile within ± 3°F. For testing conducted by the Executive Officer, vapor temperatures may be cooler than the specified tolerances without invalidating test results. The fuel tank temperatures shall be monitored at a frequency of at least once every 15 seconds.

8.2.5. Tank pressure shall not exceed 10 inches of water during the running loss test unless a pressurized system is used and the manufacturer demonstrates in a separate test that vapor would not be vented to the atmosphere if the fuel fill pipe cap was removed at the end of the test. For 2012 and subsequent model-year off-vehicle charge capable hybrid electric vehicles that are equipped with non-integrated refueling canister-only systems, a manufacturer shall demonstrate in either a separate test or an engineering evaluation, that vapor would not be vented to the atmosphere if the fuel fill pipe cap was removed at the end of the test. Transitory incidents of the pressure exceeding 10 inches of water, not greater than 10 percent of the total driving time, shall be acceptable during the running loss test if the manufacturer can demonstrate that the tank pressure does not exceed 10 inches of water during in-use operation. No pressure checks of the evaporative system shall be allowed. If the manufacturer suspects faulty or malfunctioning instrumentation, a repair of the test instrumentation may be performed. Under no circumstances will any changes/repairs to the evaporative emissions control system be allowed.

8.2.6. After the test vehicle is positioned on the dynamometer, the running loss vapor collection system shall be properly positioned at the specified discrete emissions sources, which include vapor vents of the vehicle's fuel system, if not already positioned. The typical vapor vents for current fuel systems are the vents of the evaporative emission canister(s) and the tank pressure relief vent typically integrated into the fuel tank cap as depicted in Figure 1. Other designated places, if any, where fuel vapor can escape, shall also be included.

8.2.7. The running loss vapor collection system may be connected to the PDP-CVS or CFV bag collection system. Otherwise, running loss vapors shall be sampled continuously with analyzers meeting the requirements of §86.107-90(a)(2).

8.2.8. The temperature of the collection system until it enters the main dilution airstream shall be maintained between 175°F to 200°F throughout the test to prevent fuel vapor condensation.

8.2.9. The sample bags shall be analyzed within 20 minutes of their respective sample collection phases, as described in 40 CFR §86.137-90(b)(15).

8.2.10. After the completion of the final 120 seconds, turn off the vehicle cooling fan and the vehicle underbody fan if used.

8.3. Manufacturers may use an alternative running loss test procedure if it provides an equivalent demonstration of compliance. The use of an alternative procedure also requires the prior approval of the Executive Officer. The Executive Officer may conduct confirmatory testing or in-use compliance testing using either the running loss measurement enclosure incorporating atmospheric sampling equipment or in a test cell utilizing point source sampling equipment, as specified in section III.A.2. (40 CFR §86.107-90(a)(1)), in conjunction with the procedures as outlined in either section III.D.8.1. or III.D.8.2. of this test procedure, or using the manufacturer's approved alternative running loss test procedure for a specific evaporative family.

9. Hot Soak Test

9.1. Amend the first paragraph of 40 CFR §86.138-90 as follows: For the three-day diurnal sequence, the hot soak evaporative emission test shall be conducted immediately following the running loss test. The hot soak test shall be performed at an ambient temperature of $105^{o}F \pm 10.0^{o}F$ for the first 5 minutes of the test. The remainder of the hot soak test shall be performed at $105^{o}F \pm 5.0^{o}F$ and $\pm 2.0^{o}F$ on average.

9.2. Revise subparagraph (a) to read: If the hot soak test is conducted in the running loss enclosure, the final hydrocarbon and alcohol concentration for the running loss test, calculated in section III.D.11.3.1.(b), shall be the initial hydrocarbon concentration (time = 0 minutes) C_{HCe1} and the initial alcohol concentration (time=0 minutes) $C_{CH3OHe1}$ for the hot soak test. If the vehicle must be transported to a different enclosure, sections III.D.9.3. through III.D.9.7., as modified below, shall be conducted.

9.3. Revise subparagraph (d) to include: Analyze the enclosure atmosphere for hydrocarbons and alcohol and record. This is the initial (time=0 minutes) hydrocarbon concentration, C_{HCe1} and the initial (time=0 minutes) alcohol concentration, $C_{CH3OHe1}$, required in section III.D.11.3.1.(a).

9.4. Revise subparagraph (e) to read: If the hot soak test is not conducted in the running loss enclosure, the vehicle engine compartment cover shall be closed, the cooling fan shall be moved, the vehicle shall be disconnected from the dynamometer and exhaust sampling system, and then driven at minimum throttle to the vehicle entrance of the enclosure.

9.5. Revise subparagraph (i) to read: If hot soak testing is not conducted in the same enclosure as running loss testing, the hot soak enclosure doors shall be closed and sealed within two minutes of engine shutdown and within seven minutes after the end of the running loss test. If running loss and hot soak testing is conducted in the same enclosure, the hot soak test shall commence immediately after the completion of the running loss test.

9.6. Revise subparagraph (j) to read: The 60 ± 0.5 minutes hot soak begins when the enclosure door(s) are sealed or when the running loss test ends if the hot soak test is conducted in the running loss enclosure.

9.7. For the supplemental two-day diurnal test sequence, the hot soak test shall be conducted immediately following the hot start exhaust test. The hot soak test shall be performed at an ambient temperature between 68 to 86^{o}F at all times.

9.8. The hot soak test shall be conducted according to 40 CFR §86.138-90, as revised by sections III.D.9.2. through III.D.9.7.

10. Diurnal Breathing Loss Test

10.1. A three-day diurnal test shall be performed in a variable temperature enclosure, described in section III.A.1. of this test procedure. The test consists of three 24-hour cycles. For purposes of this diurnal breathing loss test, all references to methanol shall be applicable to alcohol, unless specific instructions for ethanol are noted.

10.2. If testing indicates that a vehicle design may result in fuel temperature responses during enclosure testing that are not representative of in-use summertime conditions, the Executive Officer may adjust air circulation and temperature during the test as needed to ensure that the test sufficiently duplicates the vehicle's in-use experience.

10.3. Revise 40 CFR §86.133-90 to read as follows:

10.3.1. Revise subparagraph (a)(1) to read: Upon completion of the hot soak test, the test vehicle shall be soaked for not less than 6 hours and not more than 36 hours. For at least the last 6 hours of this period, the vehicle shall be soaked at 65^{o}F ± 3^{o}F. The diurnal breathing loss test shall consist of three 24-hour test cycles.

10.3.2. Omit subparagraph (f).

10.3.3. Omit subparagraph (i).

10.3.4. Revise subparagraph (j) to read: Prior to initiating the emission sampling:

10.3.5. Revise subparagraph (k) to read: Emission sampling shall begin within 10 minutes of closing and sealing the doors, as follows:

10.3.6. Revise subparagraph (k)(3) to read: Start diurnal heat build and record time. This commences the 24 hour ± 2 minute test cycle.

10.3.7. Revise subparagraph (l) to read: For each 24-hour cycle of the diurnal breathing loss test, the ambient temperature in the enclosure shall be changed in real time as specified in the following table:

Hour	0	1	2	3	4	5	6	7	8	9	10	11	12
(^{o}F)	65.0	66.6	72.6	80.3	86.1	90.6	94.6	98.1	101.2	103.4	104.9	105.0	104.2
Hour	13	14	15	16	17	18	19	20	21	22	23	24	--
(^{o}F)	101.1	95.3	88.8	84.4	80.8	77.8	75.3	72.0	70.0	68.2	66.5	65.0	--

10.3.8. Omit subparagraph (m).

10.3.9. Revise subparagraph (n) to read: The end of the first 24-hour cycle of the diurnal test occurs 24 hours ± 2 minutes after the heat build begins. Analyze the enclosure atmosphere for hydrocarbons and alcohol and record. This is the final hydrocarbon concentration, C_{HCe2}, and the final alcohol concentration, $C_{CH3OHe2}$, in section III.D.11.3.1.(c) which modifies 40 CFR §86.143-90, for this test cycle. The time (or elapsed time) of this analysis shall be recorded. The procedure, commencing with subparagraph (k)(1) shall be repeated until three consecutive 24-hour tests are completed. The data from the test cycle yielding the highest diurnal hydrocarbon mass shall be used in evaporative emissions calculations as required by section III.D.11.3.1.(c). which modifies 40 CFR §86.143-90.

10.3.10. Revise subparagraph (q) to read: Upon completion of the final 24-hour test cycle, and after the final alcohol sample has been collected, the enclosure doors shall be unsealed and opened.

10.3.11. Omit subparagraph (r).

10.3.12. Add subparagraph (t) to read: For hybrid electric vehicles the manufacturer shall specify the working capacity of the evaporative emission control canister, and shall specify the number of 24-hour diurnals that can elapse before the auxiliary power unit will activate solely for the purposes of purging the canister of hydrocarbon vapor.

10.3.13. Add subparagraph (u) to read: In order to determine that the working capacity of the canister is sufficient to store the hydrocarbon vapor generated over the manufacturer specified number of days between auxiliary power unit activation events for the purposes of purging the evaporative canister, the evaporative canister shall be weighed after completion of the three-day diurnal period. The weight of the vapor contained in the canister shall not exceed the working capacity of the canister multiplied by three days and divided by the manufacturer specified number of days between auxiliary power unit activation events.

10.3.14. Add subparagraph (v) to read: The manufacturer shall specify the time interval of auxiliary power unit operation necessary to purge the evaporative emission control canister, and shall submit an engineering analysis to demonstrate that the canister will be purged to within five percent of its working capacity over the time interval. For 2012 and subsequent model-year off-vehicle charge capable hybrid electric vehicles that are equipped with non-integrated refueling canister-only systems, a manufacturer may satisfy this requirement under the optional provision specified in section II.A.5.4.2.

10.15. The two-day diurnal test shall be performed in an enclosure, described in section III.A.1. of this test procedure. The test consists of two 24-hour diurnals. The test procedure shall be conducted according to 40 CFR §86.133-90, revised by sections III.D.10.3.1. through III.D.10.3.14., except that only two consecutive 24-hour diurnals shall be performed. For the purposes of this diurnal breathing loss test, all references to methanol shall be applicable to alcohol, unless specific instructions for ethanol are noted.

11. Calculations: Evaporative Emissions

11.0. Revise 40 CFR §86.143-90 as follows:

11.1. Revise subparagraph (a) to read: The calculation of the net hydrocarbon plus ethanol (or methanol) mass change in the enclosure is used to determine the diurnal, hot soak, and running loss mass emissions. If the emissions also include alcohol components other than methanol and ethanol, the manufacturer shall determine an appropriate calculation(s) which reflect characteristics of the alcohol component similar to the equations below, subject to the Executive Officer approval. The mass changes are calculated from initial and final hydrocarbon and ethanol concentrations in ppm carbon, initial and final enclosure ambient temperatures, initial and final barometric pressures, and net enclosure volume using the equations of this section III.D.11. Diurnal, hot soak, and running loss mass emissions for methanol-fueled vehicles shall be conducted according to 40 CFR §86.143-96, as amended August 23, 1995.

11.2. Revise subparagraph (a)(1) to read:

For ethanol in an enclosure:

$$M_{C2H5OH} = (V_n - 50) \times \left[\frac{(C_{S1f} \times AV_{1f}) + (C_{S2f} \times AV_{2f})}{V_{Ef}}\right] - \left[\frac{(C_{S1i} \times AV_{1i}) + (C_{S2i} \times AV_{2i})}{V_{Ei}}\right] + (M_{C2H5OHout} - M_{C2H5OHin})$$

where: M_{C2H5OH} is the ethanol mass emissions (µg)

V_n is the enclosure nominal volume. (ft^3)

C_S is the GC concentration of sample (µg/ml)

AV is the volume of absorbing reagent in impinger (ml)

V_E is the volume of sample withdrawn (ft^3). Sample volumes must be corrected for differences in temperature to be consistent with determination of V_n, prior to being used in the equation.

i = initial sample

f = final sample

1 is the first impinger

2 is the second impinger

$M_{C2H5OH,\ out}$ is the mass of ethanol exiting the enclosure from the beginning of the cycle to the end of the cycle; this only applies to diurnal testing in fixed-volume enclosures (µg); For variable-volume enclosures, $M_{C2H5OH,\ out}$ is zero

$M_{C2H5OH,\ in}$ is the mass of ethanol entering the enclosure from the beginning of the cycle to the end of the cycle; this only applies to diurnal testing in fixed-volume enclosures (µg); For variable-volume enclosures, $M_{C2H5OH,\ in}$ is zero

The enclosure ethanol mass (M_{C2H5OH}) determined from the equation above goes into the equations of subsequent sections to calculate the total mass emissions, where $M_{C2H5OHhs}$ is the ethanol mass emissions from the hot soak test, $M_{C2H5OHdi}$ is the ethanol mass emissions from the diurnal test, and $M_{C2H5OHrl(n)}$ is the ethanol mass emissions from the running loss test for phase n of the test. For diurnal testing, this calculation shall be made for each 24-hour diurnal period.

11.3. Revise subparagraph (a)(2) to read:

11.3.1. For hydrocarbons in an enclosure:

(a) Hot soak and diurnal testing in an enclosure: For fixed volume enclosures, the enclosure hydrocarbon mass is determined as:

$M_{HC} = [2.97x\ (V_n - 50)\ x10^{-4}\ x\ \{P_f\ (C_{HCe2} - rC_{C2H5OHe2})/T_f - P_i\ (C_{HCe1} - rC_{C2H5OHe1})/T_i\}] + M_{HC,\ out} - M_{HC,\ in}$

where: M_{HC} is the HC mass emissions (grams)

V_n is the enclosure nominal volume. (ft^3)

P_i is the initial barometric pressure (inches Hg)

P_f is the final barometric pressure (inches Hg)

C_{HCe2} is the final enclosure hydrocarbon concentration including FID response to ethanol in the sample (ppm C)

C_{HCe1} is the initial enclosure hydrocarbon concentration including FID response to ethanol in the sample (ppm C)

$C_{C2H5OHe2}$ is the final ethanol concentration (ppm C equivalent)

$$= \frac{2.088 \times 10^{-3} \times T_f}{P_f \times V_E} \times \left[\left(C_{S1f} \times AV_{1f}\right) + \left(C_{S2f} \times AV_{2f}\right)\right]$$

$C_{C2H5OHe1}$ is the initial ethanol concentration (ppm C equivalent)

$$= \frac{2.088 \times 10^{-3} \times T_i}{P_i \times V_E} \times [(C_{S1i} \times AV_{1i}) + (C_{S2i} \times AV_{2i})]$$

r is the FID response factor to ethanol

T_i is the initial enclosure temperature (^oR)

T_f is the final enclosure temperature (^oR)

V_E is the volume of sample withdrawn (ft^3). Sample volumes must be corrected for differences in temperature to be consistent with determination of V_n, prior to being used in the equation.

C_S is the GC concentration of sample (µg/ml)

AV is the Volume of absorbing reagent in impinger (ml)

1 is the first impinger

2 is the second impinger

i = initial sample

f = final sample

$M_{HC, out}$ is the mass of hydrocarbon exiting the enclosure from the beginning of the cycle to the end of the cycle; this only applies to diurnal testing in fixed-volume enclosures (grams)

$M_{HC, in}$ is the mass of hydrocarbon entering the enclosure from the beginning of the cycle to the end of the cycle; this only applies to diurnal testing in fixed-volume enclosures (grams)

For vehicles tested in an enclosure with the gasoline set forth in part II, section A.100.3.1.2. of the “California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles” only, measured ethanol values can be omitted so long as the resultant M_{HC} is multiplied by 1.08. If this option is used, then all terms accounting for ethanol in the applicable equations of this section III.D.11 (including ethanol concentration values of the above equation) shall equal zero.

The enclosure HC mass (M_{HC}) determined from the equation above goes into the equations of subsequent sections to calculate the total mass emissions, where M_{HChs} is the HC mass emissions from the hot soak test, M_{HCdi} is the HC mass emissions from the diurnal test, and $M_{HCrl(n)}$ is the HC mass emissions from the running loss test for phase n of the test if the enclosure method is used for running loss testing. For diurnal testing, this calculation shall be made for each 24-hour diurnal period.

For variable volume enclosures, calculate the enclosure HC mass (M_{HC}) according to the equation used above except that P_f and T_f shall equal P_i and T_i and $M_{HC,\ out}$ and $M_{HC,\ in}$ shall equal zero.

(b) Running loss mass.

The running loss HC mass per distance traveled is defined as:

$$M_{HCrlt} = (M_{HCrl(1)} + M_{HCrl(2)} + M_{HCrl(3)})/(D_{rl(1)} + D_{rl(2)} + D_{rl(3)})$$

where: M_{HCrlt} is the total running loss HC mass per distance traveled (grams HC per mile)

$M_{HCrl(n)}$ is the running loss HC mass for phase n of the test (grams HC)

$D_{rl(n)}$ is the actual distance traveled over the driving cycle for phase n of the test (miles)

The running loss ethanol mass per distance traveled is defined as:

$$M_{C2H5OHrlt} = (M_{C2H5OHrl(1)} + M_{C2H5OHrl(2)} + M_{C2H5OHrl(3)})/(D_{rl(1)} + D_{rl(2)} + D_{rl(3)})$$

where: $M_{C2H5OHrlt}$ is the total running loss ethanol mass per distance traveled (grams ethanol per mile)

$M_{C2H5OHrl(n)}$ is the running loss ethanol mass for phase n of the test (grams ethanol)

For the point source method:

Hydrocarbon emissions:

$M_{HCrl(n)} = (C_{HCs(n)} - C_{HCa(n)}) \times 16.88 \times V_{mix} \times 10^{-6}$

where: $C_{HCs(n)}$ is the sample bag HC concentration for phase n of the test (ppm C)

$C_{HCa(n)}$ is the background bag concentration for phase n of the test (ppm C)

16.88 is the density of pure vapor at 68°F (grams/ft^3)

V_{mix} is the total dilute CVS volume (std. ft^3)

and: V_{mix} is calculated per 40 CFR §86.144-90

Ethanol emissions:

$M_{C2H5OHrl(n)} = (C_{C2H5OHs(n)} - C_{C2H5OHa(n)}) \times 54.25 \times V_{mix}$

where: $C_{C2H5OHs(n)}$ is the sample bag ethanol concentration for phase n of the test (ppm C equivalent)

$C_{C2H5OHa(n)}$ is the background bag concentration for phase n of the test (ppm C equivalent)

54.25 is the density of pure vapor at 68°F (grams/ft^3)

V_{mix} is the total dilute CVS volume (std. ft^3)

and: V_{mix} is calculated per 40 CFR §86.144-90

For vehicles tested for running loss using the point source method with the gasoline set forth in part II, section A.100.3.1.2. of the "California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles" only, measured ethanol values can be omitted so long as the resultant $M_{HCrl(n)}$ is multiplied by 1.08. If this option is used, then all terms accounting for ethanol in the applicable equations of this section III.D.11 shall equal zero and both $C_{HCs(n)}$ and $C_{HCa(n)}$ in the above equation shall include the FID response to ethanol (the FID response to ethanol shall not be subtracted).

For the enclosure method:

$M_{HCrl(n)}$ is the running loss HC mass for phase n of the test (grams HC) and shall be determined by the method specified in section III.D.11.3.1.(a).

11.3.2. Revise subparagraph (a)(3) to read:

The total mass emissions shall be adjusted as follows:

(1) $M_{hs} = M_{HChs} + (14.2284/23.034) \times 10^{-6} M_{C2H5OHhs}$

(2) $M_{di} = M_{HCdi} + (14.3594/23.034) \times 10^{-6} M_{C2H5OHdi}$

(3) $M_{rl} = M_{HCrlt} + (14.2284/23.034) \times 10^{-6} M_{C2H5OHrlt}$

11.3.3. Revise subparagraph (b) to read: The final evaporative emission test results reported shall be computed by summing the adjusted evaporative emission result determined for the hot soak test (M_{hs}) and the highest 24-hour result determined for the diurnal breathing loss test (M_{di}). The final reported result for the running loss test shall be the adjusted emission result (M_{rl}), expressed on a grams per mile basis.

12. Bleed Emission Test Procedure (BETP)

12.1. Carbon Canister System Stabilization. The carbon canister system shall be stabilized to a 4,000-mile test condition using one of the following methods:

12.1.1. Stabilization on a vehicle. The canister system shall be installed on a representative vehicle, and the vehicle shall be driven for 4,000 miles using the gasoline set forth in part II., section A.100.3.1.2. of the “California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles.” The last part of this drive shall consist of an Urban Dynamometer Driving Schedule (UDDS), specified in appendix I of 40 CFR §86.

12.1.2. Carbon Canister System Purge/Load Cycling with Fuel Vapor. The carbon canister system shall be cycle aged no less than 10 cycles using the gasoline referenced in section III.D.12.1.1 by loading the canister system to 2-gram breakthrough with either a mixture of fuel vapor and nitrogen (50 ± 15 percent fuel vapor by volume) or a mixture of fuel vapor and air (50 ± 15 percent fuel vapor by volume), at a fuel vapor fill rate of 40 to 80 grams per hour. Each loading is followed by purging the canister system with 300 canister bed volume exchanges at 0.8 cfm.

12.1.3. Alternative Carbon Canister System Purge/Load Cycling with Fuel

Vapor. The carbon canister system shall be aged no less than 10 cycles using the gasoline referenced in section III.D.12.1.1 by loading and purging the carbon canister system with a method approved in advance by the Executive Officer. The alternative method shall be demonstrated to yield test results equivalent to or more stringent than, those resulting from the use of the method set forth in section III.D.12.1.1 or III.D.12.1.2.

12.2. Fuel Tank Drain/Fill and Soak. A fuel tank that represents the worst case as determined by engineering evaluation shall be drained and filled to 40 percent with the gasoline referenced in section III.D.12.1.1. The tank shall be soaked for a minimum of 6 hours to a maximum of 72 hours at 65 ± 3°F. The canister system load (section III.D.12.3) and soak (section III.D.12.4) can be performed in series or in parallel with the 6 to 72 hour fuel tank soak.

12.3. Carbon Canister System Loading. The canister system shall be loaded according to the canister loading procedure in the supplemental two-day diurnal sequence, as specified in sections III.D.3.3.5. through III.D.3.3.5.1.2. This procedure requires loading the canister with a 50/50 mixture by volume of butane and nitrogen at a rate of 40 grams butane per hour to a 2-gram breakthrough.

12.4. Carbon Canister System Soak. The canister system shall then be soaked for a minimum of 1 hour.

12.5. Carbon Canister System Purge. The carbon canister system shall be purged using one of the following methods:

12.5.1. The canister system shall be attached to a vehicle and driven on the drive cycle of the supplemental two-day diurnal sequence, as specified in section III.D.6., to purge the canister system.

12.5.2. Alternatively, the canister system may be purged at a rate and volume in a laboratory simulation, based on an engineering evaluation, to represent the net mass of hydrocarbons desorbed from the canister system during the drive cycle of the supplemental two-day diurnal sequence, as specified in section III.D.6.

12.6. Connection of Carbon Canister System and Fuel Tank. The canister system load port shall be connected to the fuel tank vent port of the otherwise sealed fuel tank and soaked for a minimum of 12 hours and a maximum of 36 hours at 65 ± 3°F. The canister system purge (engine) port shall be plugged for the remainder of the bleed emissions test.

12.7. Two-Day Diurnal Temperature Cycling. The fuel tank and canister system shall be cycled between 65°F and 105°F according to the two-day diurnal test in section III.D.10.15.

12.7.1. If using Method A (section III.D.12.8.1.) for the hydrocarbon capture method, temperature cycling and hydrocarbon capture shall occur in an environmental chamber. This chamber shall provide air circulation over the fuel tank as described in section III.A.1.1. Also, chamber temperature shall be measured and controlled as described in section III.A.1.1.1, except the wall thermocouples shall be approximately level with the fuel tank, and the fuel tank thermocouple shall measure the air within 10 inches of the exposed portion of the fuel tank. In addition, the chamber shall be insulated to enable the test temperature profile to be achieved with a heating/cooling system which has surface temperatures in the enclosure no less than 25.0°F below the minimum diurnal temperature specification.

12.7.2. If using Method B (section III.D.12.8.2.) for the hydrocarbon capture method, temperature cycling and hydrocarbon capture shall occur in a diurnal evaporative emission measurement enclosure. An enclosure as described in section III.A.1. shall be used, except that thermocouples shall be arranged per section III.D.12.7.1. and the enclosure shall be of sufficient size to contain the fuel tank and canister system.

12.7.3. If using Method C (section III.D.12.8.3.) for the hydrocarbon capture method, temperature cycling and hydrocarbon capture shall occur either in an environmental chamber as described in section III.D.12.7.1 or in a diurnal evaporative emission measurement enclosure as described in section III.D.12.7.2.

12.8. Hydrocarbon Capture Methods. Either Method A, Method B, or Method C shall be used to capture the hydrocarbon emissions from the carbon canister.

12.8.1. Method A. A Tedlar or equivalent bag of sufficient size to be able to capture the volume of air coming from the canister system during the diurnal shall be attached to the air tube of the test canister system. The bag shall be such a size as to not cause back pressure in the canister and impede vapor flow from the canister. This bag shall stay attached until the fuel reaches peak temperature (approximately 12 hours into the diurnal cycle). Each sample bag shall be analyzed as described in section III.D.12.9.1. within 20 minutes of the sample collection. During the cooling back to the minimum temperature, the air tube can be left open or connected to a new Tedlar or equivalent bag with a sufficient amount of zero air in it to allow air to pass back and forth through the canister system and bag, while not allowing pressure/vacuum to occur in the canister. If air tube is left open, a new Tedlar or equivalent bag shall be attached to the air tube at minimum fuel temperature (approximately 24 hours into the diurnal cycle). This step shall be repeated for each 24-hour diurnal period.

12.8.2. Method B. The outlet of the test canister system shall be open to the diurnal evaporative emission measurement enclosure, as described in section III.A.1., to measure hydrocarbon emissions. The pressure inside the enclosure shall not impede or assist flow through the canister system. This enclosure shall to be sized appropriately to achieve a minimum resolution of ± 5 mg at a total hydrocarbon concentration of 10 mg/total enclosure volume.

12.8.3. Method C. The canister emissions shall be continuously analyzed using a FID and integrated with continuous flow measurements to provide the mass of hydrocarbon emissions from the canister for each 24-hour diurnal period. Method C may be used subject to advance approval by the Executive Officer. Approval would require proof that all canister emissions are routed to the FID and that pressure inside the enclosure does not impede or assist flow through the canister system.

12.9. Hydrocarbon Mass Determination. There is no requirement to separately measure for alcohol emissions in this bleed emission test.

12.9.1. If using Method A (section III.D.12.8.1.) for the hydrocarbon capture method, the FID hydrocarbon analyzer shall be zeroed and spanned coinciding with each sample per 40 CFR §86.140. The removed bags shall be filled to a constant volume with Zero Air and evacuated into a FID through a sample pump to determine the concentration of hydrocarbons. The hydrocarbon mass for each 24-hour period shall then be calculated using the following equation:

$M_{HC}=16.88 \times V_{BAG} \times C_{HC} \times 10^{-6}$

where:

M_{HC} is the diurnal hydrocarbon mass emissions (grams)

16.88 is the density of pure vapor @ 68º F (grams/ft^3)

V_{BAG} is the total volume of sample gas in the sample bag (std. ft^3)

C_{HC} is the sample bag hydrocarbon concentration (ppm C)

12.9.2. If using Method B (section III.D.12.8.2.) for the hydrocarbon capture method, the FID hydrocarbon analyzer shall be zeroed and spanned coinciding with each sample per 40 CFR §86.140. The hydrocarbon emissions will be monitored by taking a minimum of 5 measurements, at hours 0, 12, 24, 36, and 48 of the two-day diurnal cycles. The mass of hydrocarbon emissions for each 24-hour period shall be determined and is equal to the maximum hydrocarbon mass value for each 24-hour period. This maximum hydrocarbon mass value is obtained by calculating and comparing the hydrocarbon mass values at each of the measurement time-points for each 24-hour period. The hydrocarbon mass value is defined as:

$M_{HC}=[2.97 \times 10^{-4} \times \{(P_x \times V_x \times C_{HCx})/T_x - (P_i \times V_i \times C_{HCi})/T_i\}] + M_{HC,\ out} - M_{HC,\ in}$

where, for fixed volume enclosures:

M_{HC} is the diurnal hydrocarbon mass emissions (grams)

P_i is the initial barometric pressure (inches Hg)

P_x is the barometric pressure during the diurnal at time of hydrocarbon measurement (inches Hg)

V_i is the initial enclosure volume (ft^3)

V_x is the enclosure volume during the diurnal at time of hydrocarbon measurement (ft^3)

C_{HCi} is the initial enclosure hydrocarbon concentration (ppm C)

C_{HCx} is the enclosure hydrocarbon concentration during the diurnal at time of hydrocarbon measurement (ppm C)

T_i is the initial enclosure temperature (º R)

T_x is the enclosure temperature during the diurnal at time of hydrocarbon measurement (º R)

$M_{HC, out}$ is the mass of hydrocarbon exiting the enclosure from cycle start to time of hydrocarbon measurement (grams)

$M_{HC, in}$ is the mass of hydrocarbon entering the enclosure from cycle start to time of hydrocarbon measurement (grams)

The measurements at the end of the first 24 hour period become the initial conditions of the next 24 hour period. For variable volume enclosures, calculate the hydrocarbon mass (M_{HC}) according to the equation used above except that $M_{HC, out}$ and $M_{HC, in}$ shall equal zero.

12.10. The final reported result shall be the highest 24-hour diurnal hydrocarbon mass emissions value out of the two 24-hour cycles.

E. Liquefied Petroleum Gas-fueled Vehicles

1. For 1983 and subsequent model-year LPG-fueled motor vehicles, the introduction of 40 percent by volume of chilled fuel and the heating of the fuel tank under the diurnal part of the evaporative test procedures shall be eliminated.

2. Calculation of LPG Emissions. The evaporative emissions for LPG systems shall be calculated in accordance with 40 CFR §86.143-78 or §86.143-90 except that a H/C ratio of 2.658 shall be used for both the diurnal and hot soak emissions.

F. Fuel Specifications

1. For 2001 through 2014 model motor vehicles (except for 2014 model year vehicles certifying to the evaporative emission standards set forth in section I.E.1.(e)), the evaporative emission test fuel shall be the fuel specified for exhaust emission testing in part II. section A.100.3. of the "California 2001 through 2014 Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2009 through 2016 Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles," except as provided in section III.G. of these test procedures.

2. All 2014 through 2019 model gasoline-fueled motor vehicles certifying to evaporative emission standards set forth in the section I.E.1.(e) (except those vehicles produced by a small volume manufacturer, as noted below, and those vehicles belonging to carry-over families allowed per section I.E.1.(e)(iii)) shall be tested for evaporative emissions on the gasoline set forth in part II., section A.100.3.1.2. of the "California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test

Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles." All 2014 through 2019 gasoline-fueled model motor vehicles not certifying to evaporative emission standards set forth in the section I.E.1.(e) that are not tested using this gasoline shall conduct evaporative emission testing with the test fuel specified in section III.F.1.

All 2020 and subsequent model gasoline-fueled motor vehicles (except those vehicles produced by a small volume manufacturer) shall be tested for evaporative emissions on the gasoline set forth in part II., section A.100.3.1.2. of the "California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles"; evaporative emission testing by the Executive Officer will be performed using said test fuel.

A small volume manufacturer shall certify all 2022 and subsequent model motor vehicles to the evaporative emission requirements using the gasoline set forth in part II., section A.100.3.1.2. of the "California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles"; evaporative emission testing by the Executive Officer will be performed using said test fuel. All 2015 to 2021 model motor vehicles produced by a small volume manufacturer that are not tested using this gasoline shall conduct evaporative emission testing with the test fuel in section III.F.1.

3. For 2015 and subsequent model motor vehicles other than gasoline-fueled vehicles (except for flexible fuel vehicles certifying to evaporative emission standards set forth in the section I.E.1.(d), as noted below), the evaporative emission test fuel shall be the applicable fuel specified for evaporative emission testing in part II. section A.100.3.3 – A.100.3.6 of the "California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles."

For 2015 and subsequent model flexible fuel vehicles certifying to the evaporative emission standards set forth in the section I.E.1.(d), the evaporative emission test fuel shall be either the fuel specified for exhaust emission testing in part II. section A.100.3. of the "California 2001 through 2014 Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2009 through 2016 Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles," or the applicable fuel specified for evaporative emission testing in part II. section A.100.3.4 of the "California 2015 and Subsequent Model Criteria

Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks and Medium-Duty Vehicles."

G. Alternative Test Procedures

1. For vehicles that are required to be certified using the test fuel in section III.F.1., a manufacturer may alternatively demonstrate compliance with the applicable evaporative emission standards using a gasoline test fuel meeting the specifications set forth in 40 CFR §86.113-94(a)(1) if the manufacturer also uses the evaporative emission test procedures set forth in 40 CFR §§86.107-96 through 86.143-96 in place of the test procedures set forth in these test procedures.

2. Manufacturers may use an alternative set of test procedures to demonstrate compliance with the standards set forth in section I.E. of these test procedures with advance Executive Officer approval if the alternative procedure is demonstrated to yield test results equivalent to, or more stringent than, those resulting from the use of the test procedures set forth in section III.D. of these test procedures.

3. If the manufacturer uses for certification a test procedure other than section III.D., the Executive Officer has the option to conduct confirmatory and in-use compliance testing with the test procedures set forth in section III.D. of this California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles.

H. Use of Comparable Federal Requirements for Carry-across Specifications and Road Profile Correction Factors

1. Upon prior written approval of the Executive Officer, a manufacturer may use the comparable federal requirements in Title 40, CFR, Part 86 in lieu of the carry-across specifications of section II.A. of these test procedures and the running loss road profile correction factors of section III.C. The Executive Officer shall approve a manufacturer's request if the manufacturer demonstrates to the Executive Officer that the alternative methodology will not adversely affect in-use evaporative emissions.

PART IV. EVAPORATIVE EMISSION TEST PROCEDURES FOR MOTORCYCLES

1. For the purposes of these procedures, the following references in 40 CFR, Part 86, Subpart B to light-duty vehicle evaporative testing shall also apply to motorcycles: 40 CFR §§86.117-78, 86.117-90, 86.121-82 and 86.121-90. In addition, 40 CFR, Part 86, Subparts E, F, and other cited sections of Subpart B are incorporated into this test procedure by reference.

2. Preconditioning shall be performed in accordance with 40 CFR §86.532-78. The provisions of §86.132-78 which prohibit abnormal loading of the evaporative emission control system during fueling and setting the dynamometer horsepower using a test vehicle shall be observed. Additional preconditioning (40 CFR §86.132-82(a)(3) and §86.132-90(a)(3)) may be allowed by the Executive Officer under unusual circumstances.

3. Instrumentation. The instrumentation necessary to perform the motorcycle evaporative emission test is described in 40 CFR §86.107-78 and §86.107-90, with the following changes:

(i) Revise subparagraph (a)(4) to read: Tank fuel heating system. The tank fuel heating system shall consist of two separate heat sources with two temperature controllers. A typical heat source is a pair of heating strips. Other sources may be used as required by circumstances and the Executive Officer may allow manufacturers to provide the heating apparatus for compliance testing. The temperature controllers may be manual, such as variable transformers, or they may be automated. Since vapor and fuel temperature are to be controlled independently, an automatic controller is recommended for the fuel. The heating system must not cause hot spots on the tank wetted surface which could cause local overheating of the fuel or vapor. Heating strips for the fuel, if used, should be located as low as practicable on the tank and should cover at least 10 percent of the wetted surface. The centerline of the fuel heating strips, if used, shall be below 30 percent of the fuel depth as measured from the bottom of the fuel tank and approximately parallel to the fuel level in the tank. The centerline of the vapor heating strips, if used, should be located at the approximate height of the center of the vapor volume. The temperature controller must be capable of controlling the fuel and vapor temperatures to the diurnal heating profile within the specified tolerance.

(ii) Revise subparagraph (a)(5) (Temperature Recording System) to read: In addition to the specifications in this section, the vapor temperature in the fuel tank shall be measured. When the fuel or vapor temperature sensors cannot be located in the fuel tank to measure the temperature of the prescribed test fuel or vapor at the approximate mid-volume, sensors shall be located at the approximate mid-volume of each fuel or vapor containing cavity. The average of the readings from these sensors shall constitute the fuel or vapor temperature. The fuel and vapor temperature sensors shall be located at least one inch away from any heated tank surface. The Executive

Officer may approve alternate sensor locations where the specifications above cannot be met or where tank symmetry provides redundant measurements.

(iii) Calibration shall be performed in accordance with 40 CFR §86.516-78 or §86.516-90.

4. Test Procedure

(i) The motorcycle exhaust emission test sequence is described in 40 CFR §86.530-78 through §86.540-78. The SHED test shall be accomplished by performing the diurnal portion of the SHED test (40 CFR §86.133-78 except subparagraphs a(1), k, and p; §86.133-90 except subparagraphs a(1), l, and s; and neglecting references to windows and luggage compartments in these sections) after preconditioning and soak but prior to the "cold" start test. The fuel will be cooled to below 30^{o}C after the diurnal test. The "cold" and "hot" start exhaust emission tests shall then be run. The motorcycle will then be returned for the hot soak portion of the SHED test. This general sequence is shown in Figure E78-10, under 4- CFR §86.130-78. The specified time limits shall be followed with the exception of soak times which are specified in 40 CFR §86.532-78 for motorcycles.

Running loss tests, when necessary, will be performed in accordance with 40 CFR §86.134-78, except references to §§86.135-82 through 86.137-82 and §§86.135-90 through 86.137-90 shall mean §§86.535-78 through 86.537-78.

(ii) A manufacturer of Class III motorcycles with annual California sales of less than 500 units using an assigned evaporative emission control system DF pursuant to section II.B.2.1.1.(vii) shall measure and report to the Executive Officer exhaust emissions from the CVS test between the diurnal and the hot soak tests even if the test is being conducted for evaporative emissions only. The exhaust emission levels projected for the motorcycle's useful life utilizing the exhaust emission DF determined during previous federal or California certification testing shall not exceed the standards set forth in section 1958, title 13, CCR.

(iii) The fuel and vapor temperatures for the diurnal portion of the evaporative emission test shall conform to the following functions within ± 1.7^{o}C with the tank filled to 50 percent ±2.5 of its actual capacity, and with the motorcycle resting on its center kickstand (or a similar support) in the vertical position.

$T_f = (1/3)t + 15.5^{o}C$

$T_v = (1/3)t + 21.0^{o}C$

where T_f = fuel temperature, ^{o}C

T_v = vapor temperature, ^oC
t = time since the start of the diurnal temperature rise, minutes.

The test duration shall be 60 ± 2 minutes, giving a fuel and vapor temperature rise of 20^oC. The final fuel temperature shall be $35.5^oC \pm 0.5\ ^oC$.

An initial vapor temperature up to 5^oC above 21^oC may be used. For this condition, the vapor shall not be heated at the beginning of the diurnal test. When the fuel temperature has been raised to 5.5^oC below the vapor temperature by following the T_f function, the remainder of the vapor heating profile shall be followed.

(iv) An alternate temperature rise for the diurnal test may be approved by the Executive Officer. If a manufacturer has information which shows that a particular fuel tank design will change the temperature rise significantly from the function above, the manufacturer may present the information to the Executive Officer for evaluation and consideration.

(v) The hot soak evaporative emission test shall be performed immediately following the "hot" start exhaust emission test. This test is described in 40 CFR §§86.138-78 and 86.138-90, except for §§86.138-78(d) and 86.138-90(e) which are revised to require that the motorcycle be pushed with the engine off rather than driven at a minimum throttle from the dynamometer to the SHED.

(vi) Calculations shall be performed in accordance with 40 CFR §86.143-78 or 86.143-90, except the standard volume for a motorcycle shall be $5ft^3$ instead of $50\ ft^3$.

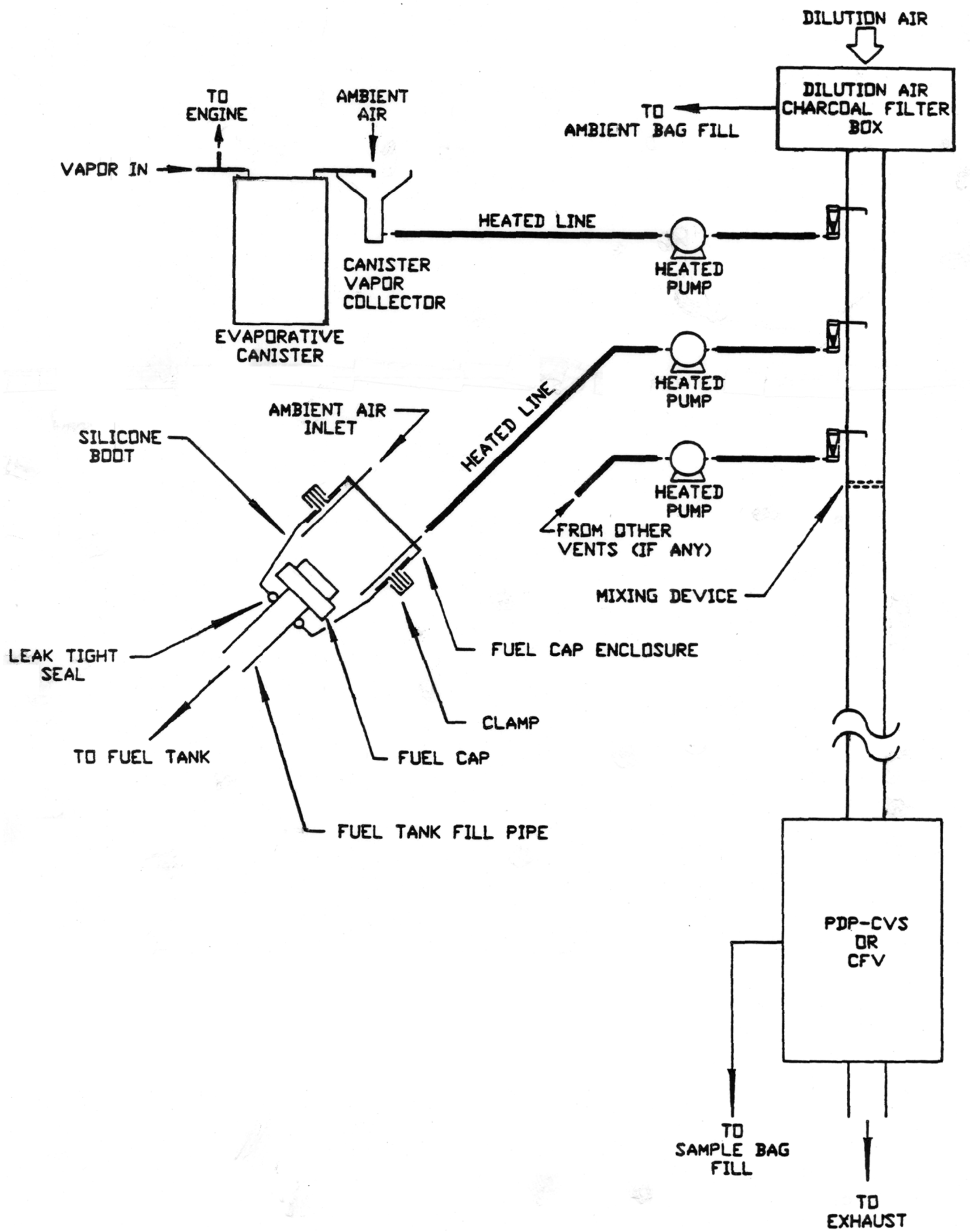

Figure 1: Running Loss Vapor Vent Collection System

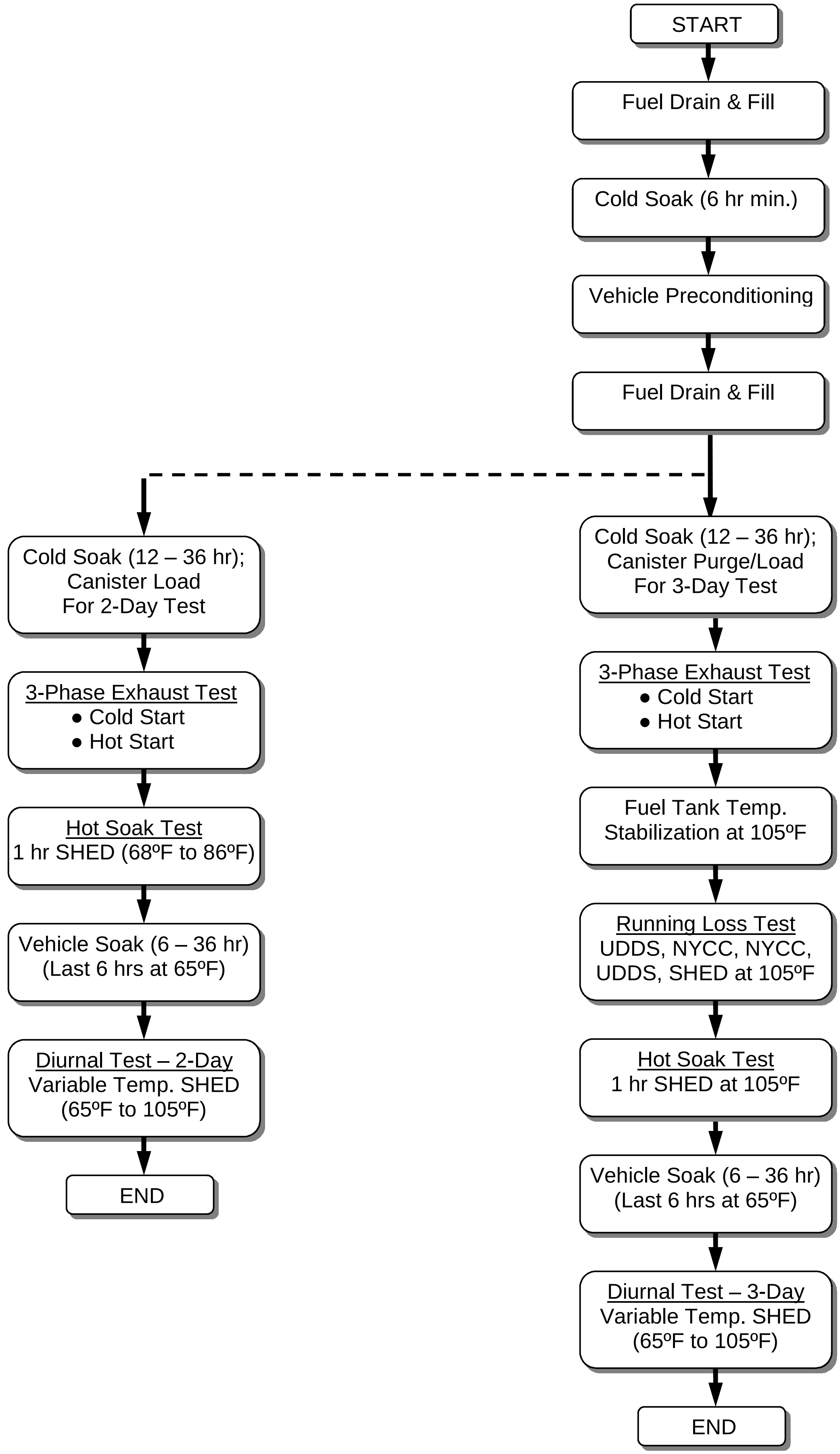

Figure 2: Test Procedure for 2001 and Subsequent Model Motor Vehicles

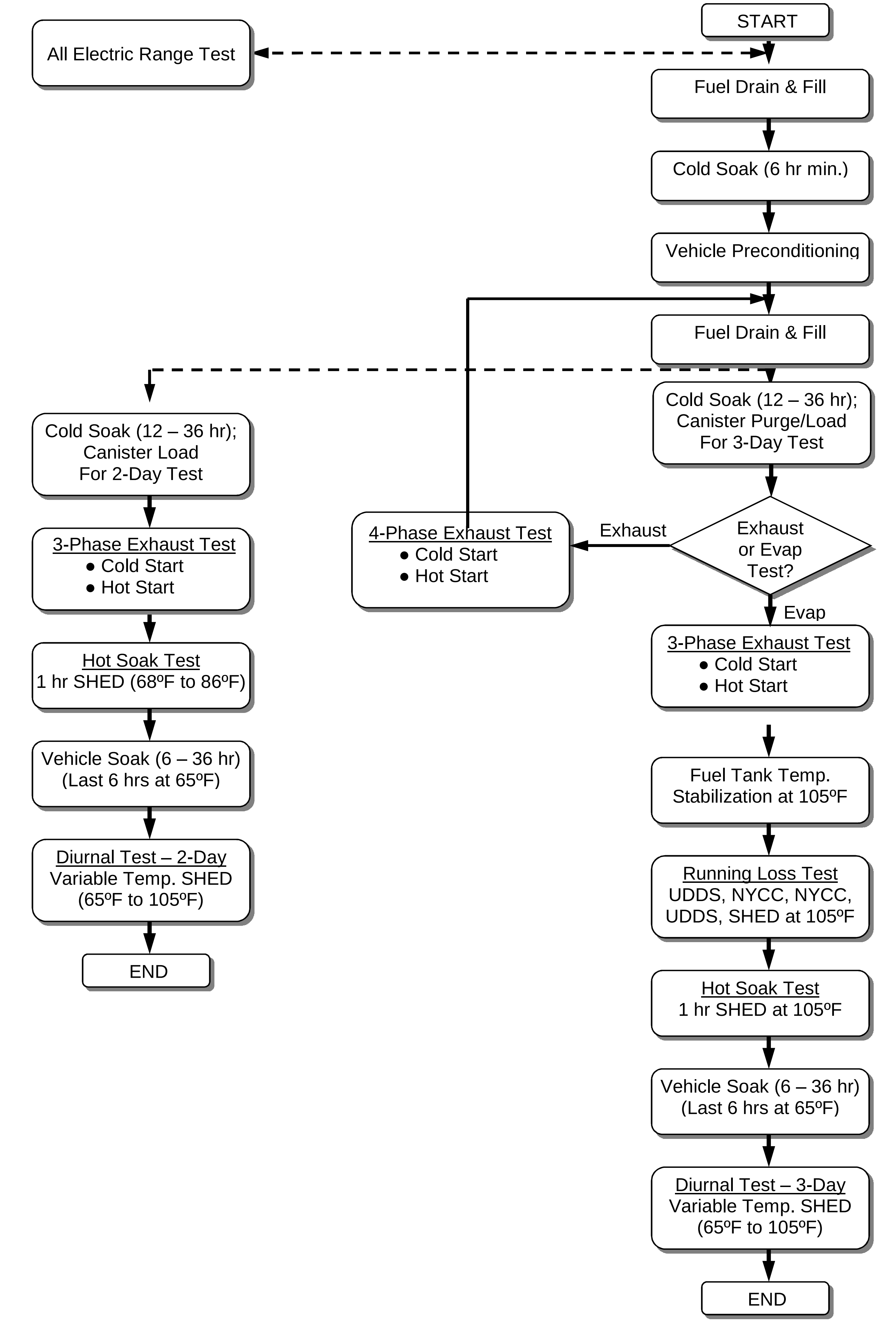

Figure 3A: Test Procedure for 2001 and Subsequent Model Hybrid Electric Vehicles

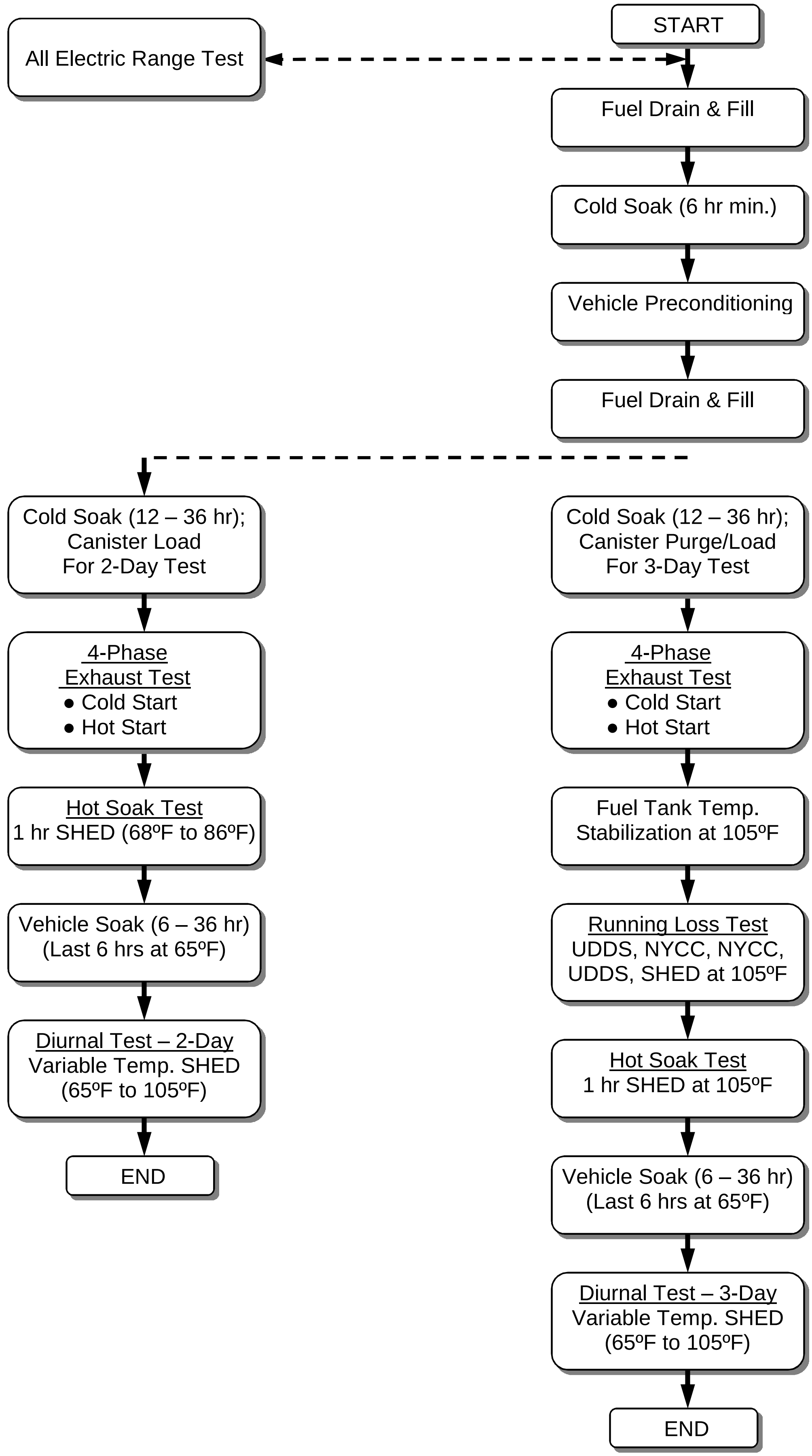

Figure 3B: Test Procedure for 2001 and Subsequent Model Hybrid Electric Vehicles